# REVUE AGRICOLE ET SUCRIERE DE L'ILE MAURICE

VOL. 40 - NOVEMBRE - DECEMBRE 1961 NO. 6

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9 MAR 1962

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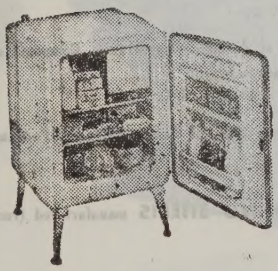

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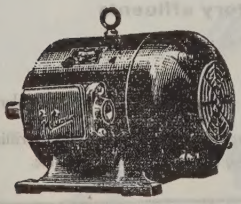

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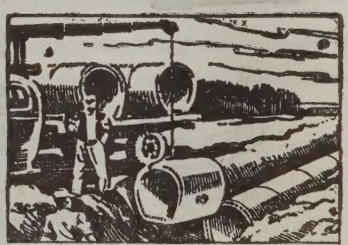

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# REVUE AGRICOLE ET SUCRIÈRE DE L'ÎLE MAURICE

VOL. 40 No. 6 NOVEMBRE - DECEMBRE 1961

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La rédaction accueillera avec reconnaissance des illustrations appropriées au texte de tout article ou mémoire ; les **photographies** devront autant que possible avoir les dimensions suivantes : 9 x 14 cm. ou 3 1/2 x 5 1/2 pouces et être faites sur papier glacé.

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1961

# NOTES ET ACTUALITÉS

## L'Etat encourage les industries secondaires

Le Gouvernement vient de promulguer une loi, ("The Income Tax (Amendment No. 2) Ordinance, 1961") qui amende la loi régissant l'impôt sur le revenu et a pour but principal d'encourager le développement ou l'établissement des industries secondaires par des allocations spéciales pendant un certain nombre d'années. Des allocations sont aussi prévues pour l'industrie du Thé et la recherche scientifique appliquée aux industries.

Presque en même temps une autre loi ("The Agricultural Bank (Amendment) Ordinance, 1961") a été promulguée pour autoriser la Banque Agricole à faire des prêts pour le développement des cultures, notamment celle du Thé, faites sur des terres appartenant à l'Etat et qui par conséquent ne peuvent être hypothéquées en garantie. La Banque est maintenant autorisée à accepter toute garantie qui lui semblera raisonnable.

Ce sont là d'heureuses initiatives qui auront sans doute un effet marqué sur l'accroissement de la culture du Thé qui était restée stationnaire depuis le passage des cyclones du début de l'année dernière. Si ces mesures s'imposaient, il fallait quand même les adopter, et il convient en conséquence d'en savoir gré au Gouvernement et à ceux qui l'ont amené à les adopter, en particulier les Ministères de l'Agriculture et des Finances et leurs principaux conseillers techniques.

## Conférence sucrière du Commonwealth

La Chambre d'Agriculture de l'Ile Maurice et le Mauritius Sugar Syndicate ont été avisés par leur représentant à Londres, M. A. Guy Sauzier, C.B.E., que la Conférence sucrière du Commonwealth avait pris fin le 24 novembre.

Le prix des sucres pour l'année 1962 a été fixé à £ 45-15s-3d par tonne longue, soit 13s-3d, de plus que le prix fixé pour l'année 1961. Ce prix ne s'applique qu'à notre contingent garanti, c'est-à-dire à cette partie seulement de notre contingent global que le Gouvernement du Royaume-Uni s'est engagé à acheter aux termes de l'Accord du Commonwealth, et qui se chiffre pour l'année 1962 à 350,075 tonnes longues, soit 1,675 tonnes de moins que le contingent garanti de 1961.

La durée de l'Accord du Commonwealth sur le sucre a été prolongée d'une année, c'est-à-dire jusqu'à la fin de 1969.

## Service de Vulgarisation des Planteurs sucriers

L'Office de Réhabilitation des Planteurs sucriers va créer un nouveau service, une section de vulgarisation qui aura pour mission l'amélioration de la culture de la canne à sucre dans tout le pays. C'est au Ministre de l'Agriculture que l'on doit l'initiative de ce projet aujourd'hui en voie de réalisation. A l'expérience de l'art de cultiver la canne aujourd'hui séculaire chez les Mauriciens, les progrès rapides de la science, ou plutôt de toutes les sciences dont l'agriculture est interdépendante, ont imposé la nécessité de la recherche scientifique à pied d'œuvre dans tous les domaines de notre industrie-mère. Cela avait commencé modestement avec Philippe Bonâme qui s'est attaqué, à la lueur des connaissances du début du siècle, à de multiples problèmes agricoles d'application locale, surtout l'étude des sols, l'utilisation des amendements, la création de nouvelles variétés. L'œuvre de Bonâme fut continuée par ses successeurs pour donner jour en 1930 à la création au sein du Département d'Agriculture d'une Station de Recherches Sucrières qui devait devenir l'Institut de Recherches Sucrières en 1953 et passer sous le contrôle direct de l'industrie sucrière. Dès ce moment, la recherche agronomique appliquée à la canne à sucre prenait chez nous un essor remarquable. Tous reconnaissent aujourd'hui l'utilité de cette recherche et se rendent compte qu'elle ne pourra porter tous ses fruits que si les découvertes qui en résultent sont efficacement et rapidement transmises aux producteurs. C'est ici qu'un service de vulgarisation devient indispensable car il doit servir de véhicule aux connaissances nouvelles et veiller à leur application efficiente et raisonnée, permettant ainsi au chercheur spécialisé de s'adonner totalement à son rôle.

S'inspirant de la recommandation faite par la Commission Economique de 1948 à l'effet que l'industrie sucrière, étant solidement établie, pouvait elle-même organiser son propre service de recherche, le Ministre de l'Agriculture considéra que le complément naturel de cette recommandation était aujourd'hui de laisser à l'industrie la charge de son service de diffusion et de vulgarisation. La question fut soumise au Comité du *Sugar Planters' Rehabilitation Fund* qui, après l'avoir longuement étudiée, a recommandé la création de ce nouveau service. C'est la *Sugar Planters' Rehabilitation Fund* qui l'organisera et le dirigera. Cette décision réunit ainsi en un ensemble harmonieux l'aide pratique que cet Office apporte déjà aux planteurs sucriers par la *Sugar Planters' Mechanical Pool* et le *Sugar Planters' Cane Nursery*.

## Au Collège d'Agriculture

Sur la recommendation du Ministère de l'Agriculture le personnel enseignant permanent va bientôt être augmenté par la nomination d'un chargé de cours de biologie et de deux nouveaux assistants de laboratoire. Le personnel enseignant permanent se composera donc à l'avenir d'un directeur, de quatre chargés de cours et de quatre assistants. En sus de ce noyau le Collège fait appel à de nombreux spécialistes et techniciens du Département d'Agriculture, de l'Institut de Recherches Sucrières et de l'industrie privée.

M. R. Burrenchobay, chargé de cours de Chimie, qui était en congé à

l'extérieur, rentrera à Maurice le 30 décembre. M. R. Latulipe, chargé de cours de Physique et de Mathématiques, est parti pour l'Europe le 1er décembre en congé de détente ; il sera de retour en mars de l'année prochaine.

Depuis novembre des livres de classe couvrant les sujets les plus importants ont été mis à la disposition de tous les étudiants contre un dépôt remboursable à la fin de leurs études. C'est là une heureuse initiative et une aide substantielle car les livres prêtés coûtent environ 700 roupies par étudiant et ne sont pas à la portée des bourses de tous les parents.

C'est M. Gérard Tremblay, le conseiller canadien en matières de marketing venu à Maurice en juillet dernier, qui a fait la seconde des causeries hors-série inaugurées récemment. Le sujet avait pour titre « Le rôle des offices de commercialisation des produits agricoles ». Au cours de sa conférence M. Tremblay a fait ressortir l'importance que l'on attachait ailleurs à pourvoir de tels offices de personnel ayant eu un entraînement professionnel adéquat. Il pense qu'il en sera de même à Maurice et que les diplômés du Collège d'Agriculture y trouveront un débouché.

## La "Mauritius Dairy Company Limited"

Nous saluons avec plaisir la création à Floréal d'un établissement moderne de pasteurisation et d'homogénéisation du lait. Cette belle réalisation est presqu'entièrement l'œuvre du Docteur Jocelyn Maingard, M.B.E., qui aidé de quelques autres personnalités, s'est employé pendant des années à faire aboutir un projet de première nécessité pour l'Ile Maurice. Il en était grand temps. En effet quiconque sait comment se produit et se colporte le lait chez nous et est en mesure de faire la comparaison avec le traitement de cette denrée de première nécessité dans les pays évolués, accueillera l'ouverture de cet établissement avec la plus vive satisfaction.

La « Mauritius Dairy » a commencé ses activités commerciales le 1er novembre. Elle a fait face courageusement aux difficultés inévitables de démarrage et il est à souhaiter qu'elle les surmontera toutes pour le plus grand bienfait des consommateurs.

Le lait pasteurisé et conditionné a été mis à la disposition de tous les vendeurs habituels au prix de gros de 35 sous la pinte pour être revendu au consommateur au prix uniforme de 40 sous dans tous le pays.

## L'utilisation rationnelle des engrais

Nous n'avons pas eu l'occasion jusqu'ici de signaler un ouvrage important qui porte le titre ci-dessus et dont les auteurs sont le Professeur V. Ignatieff et Sir Harold Page de la F. A. O. (XXIV + 379 pages, 43 illus. 20/-). Ce traité s'adresse particulièrement aux directions des services agricoles, aux services de vulgarisation, à tous ceux que leurs fonctions de conseillers ou d'enseignants mettent en rapports constants avec les agriculteurs et les organisations agricoles et qui ont pour mission de faire mieux comprendre ce que sont les engrais commerciaux et

organiques. Mais les exploitants, ainsi que les élèves des instituts agronomiques, constateront eux aussi que ce livre peut leur rendre d'inestimables services.

La première édition de *L'utilisation rationnelle des engrais* date de 1950. Cette nouvelle édition, entièrement revue et considérablement augmentée, a bénéficié de la collaboration de 96 spécialistes des sols et des cultures, travaillant dans 34 pays, et qui ont mis en commun leurs connaissances et leur expérience.

On trouvera dans ce volume, rédigé de manière simple et concise, les renseignements les plus récents sur les éléments nutritifs des végétaux et les facteurs physiques et économiques de l'emploi des engrais, ainsi que les conceptions modernes de l'utilisation rationnelle des engrais pour la production agricole et pour l'entretien et l'amélioration de la fertilité du sol.

Du fait que la question est abordée sur le plan mondial, les principes fondamentaux de l'utilisation rationnelle des engrais se dégagent beaucoup plus nettement. Mais on a veillé aussi à fournir assez de renseignements précis pour que le lecteur puisse adapter ces principes aux conditions et aux besoins locaux.

Les rapports qui existent entre les engrais et les assolements, la lutte contre l'érosion, l'irrigation, le drainage, le chaulage et autres pratiques agricoles sont décrits de manière très claire. Les principes fondamentaux sont exposés simplement, tels que les conçoivent les gens de métier. Cet ouvrage n'est pas une compilation d'autres manuels.

L'agriculture a pour but de nourrir et de vêtir les hommes. Bien qu'il faille poursuivre la recherche afin de pouvoir mieux utiliser les éléments physiques et biologiques qui jouent un rôle important dans la production agricole, les progrès énormes de la science ont permis de protéger les cultures et d'en accroître le rendement. Si dans toutes les parties du monde on appliquait à la production agricole les connaissances scientifiques acquises et les techniques nouvelles, de grands progrès seraient realisés vers l'objectif tendant à assurer à tous un régime alimentaire suffisant et une vie saine. L'un des facteurs les plus importants de la production agricole est l'utilisation rationnelle des engrais. Il n'y a plus d'agriculture sans engrais. Faut-il au moins les utiliser judicieusement, c'est ce que cet ouvrage enseigne au plus haut degré.

## Les forêts et les engrais

Il est peut-être curieux que jusqu'ici on n'ait guère porté attention à l'emploi de fertilisants en culture forestière. On sait cependant que la culture des grandes productions arborifères tropicales : cocotier, caoutchouc, café, palmiers à huile, a donné de meilleurs résultats avec l'emploi judicieux de fertilisants. Dans certains cas ces cultures ne seraient pas rentables sans de tels apports. Pourquoi n'en serait-il pas de même pour des arbres forestiers? Il semblerait même que ce devrait être là une nécessité absolue, du moins pour les parties élevées de l'île où les terres sous bois ont longtemps été exposées à un lessivage intense grâce à la forte pluviosité. Il ne faudrait pas peut-être s'attendre à des résultats spectaculaires, surtout avec l'azote, dont l'emploi ne serait probablement pas rentable sauf pour quelques essences hâtives, qu'il serait d'ailleurs assez dangereux de faire pousser trop vite à cause de l'exposition aux vents forts. Vu cependant la

carence de beaucoup de nos sols des régions humides et superhumides en acide phosphorique, en potasse et en calcium, des essais valent sans doute la peine d'être tentés. On arriverait vraisemblablement à produire le volume de bois désiré en un temps plus court et sur une superficie moindre, ce qui finirait peut-être par rendre disponible pour d'autres cultures une partie des terres occupées par des essences forestières. Si de tels essais étaient entrepris il faudrait faire une place aux oligo-éléments, car une large partie des terres dites forestières ne porte qu'une couverture de végétation rabougrie, indice de sérieuses carences.

## En bref

M. Gérard Tremblay qui était venu à Maurice étudier les dispositions à prendre pour établir un office de la commercialisation des produits agricoles a regagné le Canada le 2 décembre.

Les Services Entomologiques du Département d'Agriculture ont récemment découvert la présence d'un nouvel ennemi des légumes. C'est le *Bagrada hilaris* qui s'attaque aux crucifères, et dont la présence a aussi été signalée dans l'Inde et l'Est Afrique. A Maurice cette pentatomide s'est manifestée sur la brède de Chine à Abercrombie près de Port Louis. Heureusement que cette peste est facilement jugulée par des pulvérisations de rogor 40 et d'orthodibrom.

Nous avons eu récemment le plaisir de revoir M. Robert d'Avice, ancien directeur-adjoint du Département d'Agriculture qui a passé quelques semaines sur nos plages en compagnie de sa famille.

M. Jean de Boucherville-Baissac, *Fisheries Officer*, est parti pour l'Europe en congé le 6 décembre.

M. Willie Smith, *Supernumerary Senior Agricultural Officer*, qui était venu à Maurice sous contrat comme *Supernumerary Agricultural Engineer* en 1958, a demandé et obtenu l'autorisation de se retirer du service pour prendre de l'emploi avec Messrs. Booker Brothers Ltd. qui vont créer un grand établissement sucrier au Nigeria. M. Smith est parti le 13 novembre. Capable et consciencieux, le Département d'Agriculture perd en M. Smith un de ses techniciens de grande expérience.

# RETIREMENT OF Mr. A. NORTH COOMBES

On the 30th September, in the evening, the Staff of the Department of Agriculture and their numerous guests from the Colonial Secretary's Office, the Ministry of Agriculture and Natural Resources, the Sugar Industry Research Institute and the Sugar Producers' Association, entertained Mr. A. North Coombes, O.B.E., to a farewell party on the occasion of his retirement as Director of Agriculture. The following were among those present:— The hon. the Colonial Secretary and Mrs. Vickers, the hon. the Minister of Agriculture, the hon. Mr. R. Balgobin, Mr. & Mrs. J. R. Williams, Mr. & Mrs. W. Smith, Mr. & Mrs. Ph. Guérandel, Mr. & Mrs. J. Pablot, Mr. & Mrs. G. Orian, Mr & Mrs. Claude Noël, Mr. & Mrs L. de Chazal, Mr. P. E Bouvet, Mr. & Mrs. P. d'Arifat, Mr. & Mrs. A. Harel, Mr. & Mrs. F. North Coombes, Mr. & Mrs. M. D. ffrench-Mullen, Mr. & Mrs. R. B. J. Deane, Mr. & Mrs. A. Orian, Mr. & Mrs. R. Rivalland, Mr. & Mrs L. Orieux, Mr. & Mrs. S. Belcourt, Mr. & Mrs. G. Carver, Mr. S. Ramlogun, Mr. & Mrs. J. Monty, Mr. & Mrs. S. Chuttur, Mrs H. Celestin, Mr. & Mrs. S. Latour, Mr. & Mrs. L. Hennequin, Mr. & Mrs. J. H. Julien, Mr. & Mrs. C. Courtois, Mr. & Mrs. R. Mamet, Mr. & Mrs. E. Louise, Mr. & Mrs. D. Seeyave, Mr. & Mrs. P. Dupavillon, Mr. & Mrs. R. Antoine, Mr & Mrs. S. Feillafé, Mr. & Mrs. C. K. Pearson, Mr. & Mrs. A. Béranger, Mr. H. Alleaume, Mr & Mrs. L. A. Moutia, Mr. S. Moutia, Mr. & Mrs. R. Rochecouste, Mr. & Mrs. G. Bouloux, Mr. J. Fakim, Mr. & Mrs H. Kœnig, Mr. A. Valasois, Mr. Y. Lefébure, Mr. A. d'Emmerez de Charmoy, Mr. R. Noël, Mr. J. Félix. Mr. E. T. Lagaité, Mr. & Mrs. P. Regnard, the Misses Pivetau, Cathan, Coquet, Nallétamby, Gopaul, Mr. M Kadel, Mr. & Mrs. L. Suzor, Mr. & Mrs. F. Monneron, Mr. & Mrs. Etienne, Mr. Sooltangos, Mr. & Mrs. D. N. Andrews and many others.

Mr. J. Pablot, President of the *Staff Association* of the Department, in a short introductory speech welcomed the guests and called upon Mr. Alfred J. E. Orian to speak on behalf of the Staff. Mr. Orian retraced Mr. Coombes' career and on behalf of all present wished him a long and happy retirement. The hon. S. Boolell, Minister of Agriculture, addressed the assembly, paying tribute to the retiring director.

At the end of the Minister's speech, Mrs. Ginette Latour, presented Mr. Coombes on behalf of friends and colleagues with a lovely silver salver and a crystal whisky set in token of their esteem and friendship. Engraved in the centre of the salver is the outline of a map of Mauritius with the following inscription :

" *To Alfred North Coombes*, O. B. E., *from his Colleagues and Friends of the Department of Agriculture on the occasion of his retirement as Director, 30.9.61.* "

This, however, did not conclude the proceedings. A handsome wooden spade, also with an inscription on a silver plate, was then presented by Mrs. J. Henri Julien who invited Mr. Coombes to plant a tree (a *Ficus elastica*, specially chosen for its resistance to cyclones) in the grounds of the College of Agriculture where his first contact with the Department had taken place 34 years previously when he joined the College as a student. Finally, Mrs. Alfred Orian presented the retiring director with an album of views of the Department.

... ... ... ...

Monsieur Alfred North Coombes, O.B.E., directeur du Département d'Agriculture, qui a déployé pendant 30 ans une activité sans bornes pour améliorer les conditions agricoles du pays, s'est retiré du service le 30 septembre dernier.

Après de brillantes études au Collège Royal et au Collège d'Agriculture, Alfred North Coombes fut proclamé lauréat de cette dernière institution en 1928 ; la même année il était admis à l'Université de Reading pour parfaire ses études professionnelles et obtint en 1931 le degré de B.Sc. Agric. Il se rendit ensuite au Danemark pour un stage de quelques mois sur une ferme laitière.

Dès son retour à Maurice en 1932, Coombes débuta dans le Service comme *Assistant Agricultural Instructor*. Il assuma peu de temps après la direction p i. du *Tobacco Research Station* et fut bientôt promu au poste d'*Agronomist* du Département d'Agriculture, qu'il occupa jusqu'en 1940.

Au début de la seconde guerre mondiale il s'enrôla dans les Forces armées où ses qualités de chef lui valurent rapidement la promotion au grade de capitaine.

Son service militaire terminé, il réintégra le Département d'Agriculture et occupa successivement les postes de *Senior Agricultural Officer* et de *Deputy Director*. Durant la période 1950-1960 il assuma intérimairement en trois reprises les fonctions de directeur et fût confirmé à ce haut poste en 1960.

Pendant une grande partie de sa carrière, Alfred North Coombes a été chargé de cours d'agriculture au Collège d'Agriculture. Depuis 1947 il est rédacteur-en-chef de la Revue Agricole et Sucrière de Maurice.

Les nombreux travaux qu'il a publiés sous forme de brochures ou de fascicules témoignent de son expérience en matières agricoles. Citons, notamment : — « The Evolution of Sugar Cane Culture in Mauritius », « The Fibre Industry of Mauritius », « Tea Cultivation in Mauritius », « Potato culture in Mauritius », « Experiments with Pineapples ». Il s'est beaucoup intéressé à l'histoire agricole du pays et a acquis une grande connaissance de nos cultures secondaires.

Son activité s'est étendue à notre principale dépendance et nous croyons savoir qu'il a presque complété un ouvrage sur l'histoire de Rodrigues.

Dans la pleine mesure où les intérêts agricoles se confondent, à Maurice, avec les intérêts généraux du pays, on peut dire qu'Alfred North Coombes a toujours mené le bon combat. Sa contribution aux travaux de la Commission Economique en 1947, ses recommandations concernant la réorganisation du Collège d'Agriculture, l'utilisation judicieuse des terres, l'amélioration de la race laitière créole, les Pas Géométriques, en sont des preuves indéniables. C'est à son initiative que l'on doit la coordination initiale des conditions d'emploi de la main d'œuvre dans les services du gouvernement.

Toute œuvre comme toute existence doit être appréciée à la lumière de l'effort fourni. Par sa lutte constante pour promouvoir la cause de l'Agriculture, Coombes a bien mérité de son pays. La distinction d'*Officer of the British Empire* que lui a conféré Sa Majesté la Reine en 1956, fut la juste récompense d'une carrière qui est un enseignement et un exemple.

La *Revue Agricole* se devait de rendre hommage à cet infatigable travailleur et le féliciter d'avoir bien voulu accepter de prendre la direction du Collège d'Agriculture, où nos futurs techniciens pourront tirer profit de ses connaissances et de ses conseils éclairés.

A.W.

# MAURITIUS JOINS THE F. A. O.

On the occasion of the last biennial conference of F.A.O. which the Hon. S. Boolell, Minister of Agriculture, and Mr Gaston Bouloux, Principal Assistant-Secretary to the Ministry of Agriculture, attended in November in Rome, Mauritius was admitted as an associate member of this organization of the United Nations. Thirteen other countries were admitted at the same time bringing the total of member states to 104. Although neither the U.S.S.R. nor its satellites belong, three communist nations : Rumania, Poland and Yugoslavia are members.

F.A.O. ... The Food and Agriculture Organization of the United Nations grew out of the United Nations Conference on Food and Agriculture held at Hot Springs, Virginia U.S.A., in May 1943.

At that Conference 44 nations agreed to work together to secure a lasting peace through freedom from want. In particular, they agreed that international, co-operative effort was needed to raise the standards of living of the under-nourished two-thirds of the world's population. They considered that the farmers of the world could produce enough if they were able to make full use of modern facilities and methods ; and that full time work for all could be provided by increased production and efficient distribution.

F.A.O. was formally founded at Quebec, Canada, in October 1945 — the first of the new specialized United Nations agencies to be created after the war. By the end of 1955, FAO's membership had risen to 72. It is now 104.

The chief aims of the organization are as follows :

to help nations raise the standard of living ;

to improve the nutrition of the peoples of all countries ;

to increase the efficiency of farming, forestry and fisheries ;

to better the condition of rural people ;

and, through all these means, to widen the opportunity of all people for productive work.

### The Organization

FAO is governed by a Conference, normally meeting once every two years, in which each Member Nation has one vote. Between conference sessions, the Council of FAO acts as the Organization governing body.

In addition to headquarters at Rome, FAO has regional offices — in Washington for North America ; in Cairo for the Near East ; in Bangkok for Asia and the Far East and in Rio de Janeiro, Mexico City and Santiago de Chile for Latin America.

### FAO and the United Nations

Although FAO is an autonomous, independent organization, it is at the

same time a member of the United Nations family of specialized agencies. With the United Nations itself, FAO works through the Economic and Social Council (ECOSOC). Collaboration is maintained with the respective United Nations Economic Commissions for Europe (ECE), for Asia and the Far East (ECAFE), and for Latin America (ECLA), all set up by ECOSOC.

FAO has close ties with the other specialized agencies of the United Nations and especially with the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Bank for Reconstruction and Development, the World Health Organization (WHO) and with the United Nations Children's Fund (UNICEF).

**How FAO works**

As an association of sovereign governments in what has been called an " international self-help co-operative " in food and agriculture (including fisheries and forestry, FAO's functions include :

Promoting and recommending national and international action with respect to research, improvement of education and administration, conservation, processing, marketing, distribution, agricultural credit, international commodity arrangements, and the formulating of such technical assistance as governments may request in carrying out their activities along these lines in order to reach FAO's objectives.

FAO is no super-government, has no executive powers, and is without authority or funds to buy and distribute food, machinery or fertilizers, or to operate research laboratories. Through its functions it can help its Member States in two main ways :

1. by maintaining an intelligence service to gather, analyze and disseminate technical and economic information which the FAO staff and Member States may use as the bases of sound action, and

2. by developing action programs to supplement those initiated by governments, which FAO, on the request of governments, can assist them to carry out.

Previous to 1950, FAO's budget did not allow of any considerable active field work, for such intensive direct assistance to governments on the myriad problems of food and agriculture requires large funds. This work was therefore limited until the formation in 1950 of the United Nations Special Fund for Economic Development of Underdeveloped Areas. Since then, some 28 percent of this fund has been available each year for work in FAO's fields, the largest share that is devoted in the work of any United Nations.

These funds are used to finance the sending of technical advisers in answer to specific requests from Member States. This Expanded Technical Assistance Programme (ETAP) also covers the sending of technicians from the re-

questing countries on fellowships for training overseas, and the running of training centres, either on a national or an international basis. It is thus a logical extension of FAO's work into the field of action.

Some examples may illustrate the two kinds of work which FAO carries out :

*Maintaining an intelligence service*

To know how malnutrition may be reduced, it is first necessary to know what foods people are getting in comparison with their requirements. Thus, two early projects of FAO were the World Food Surveys of 1946 and 1952. These surveyed the situation and suggested certain nutritional targets which could be reached by 1960, as a start toward further improvement in the feeding of mankind.

FAO has organized and conducted seminars and training courses in statistical methods, crop sampling, the formulation and analysis of agricultural and related development projets. A continuing economic intelligence service is supplied through periodical bulletins of statistics on production and trade in agriculture, forestry and fisheries, with yearbooks in the same fields. Annually, FAO crystallizes all this data relating to the situation and outlook into a report called *The State of Food and Agriculture*.

Other examples of such work are the monthly *Plant Protection Bulletin*, giving news of outbreaks of plant pests and diseases, quarantines and other measures to suppress them ; the quaterly *Food and Agricultural Legislation* ; the forestry quarterly *Unasylva*, and meetings on suitable subjects throughout the whole range of the organization's activities. To all of these, in one way or another — as through the better training of national technicians — both FAO's regular programme and the ETAP extension of it contribute.

*Assistance to action*

The Expanded Technical Assistance Programme, with its augmented funds permitting the sending of technical advisers to work directly with national authorities, has vastly enlarged FAO's ability to serve its members in the action phases.

In FAO's earliest days, expert missions of a general or special nature were sent to Greece, Poland, Thailand, Venezuela. Individual advisers helped to deal with such problems as the infestation of stored foodstuffs, the improvement of nutritional standards, the control of animal diseases, and so on. A similar mission was sent to the Yemen.

Stimulus and assistance to action also have been given through the Forestry and Timber Commissions for Europe, Asia and Latin America ; the Fisheries Councils for the Indo-Pacific, Latin American, and Mediterranean areas, and the European Commission for the control of Foot-and-Mouth Disease founded in 1954.

One activity may serve as an example. In 1947 FAO arranged a meeting between European breeders of hybrid maize, who were out of touch with technical developments made during the war, and North American experts. The best adapted seed was imported and co-operatively tested under various soil and climatic conditions. FAO has invested about $ 50,000 in the whole project. In 1952, with less than 5 percent of Europe's maize acreage planted in hybrids, the increased yield was valued at nearly $ 25,000,000. By 1955, the project was so advanced that its operation was handed over to the subscribing countries, and a new programme for testing hybrids evolved in Europe was started.

Similar work is being carried forward in other regions, and with other crops. Under the International Rice Commission, based on Bangkok, Asian countries have co-operated in hydridizing and testing seed of the *indica* and *japonica* strains of rice, which may yield increases of as striking a nature as have occurred with maize, and this commission has also been much concerned in the fertilization and mechanization of this crop. Other similar projects have been concerned with co-operative work on pasture and forage crops in the Mediterranean and on wheat and barley breeding in the Near East.

**Expanded Technical Assistance Programme**

When the ETAP Special Fund became available requests were already being received from underdeveloped countries for expert technical advisers. Hundreds of assignments have been completed and hundreds of experts have been at work in many countries. Their work covers the widest range of problems in every field in which FAO itself operates.

In the international programme, experts are drawn from all participating countries, for even those underdeveloped in some aspects can usually provide experts in some other lines in which they have specialized.

The requesting government gives evidence of its serious intent and ability to carry through the project, so that as soon as possible the outside technical advisers may withdraw, leaving a self-operating improvement. The government must normally provide a share of the local costs and facilities for the work, while FAO meets salaries and initial travel costs, with perhaps a minimum of working and demonstration equipment.

Again, one concrete example may illustrate the ETAP accomplishments. In Libya, improper methods of slaughtering and flaying, of curing the hides by drying or salting, and of tanning them, result in rough, weak leather full of blemishes, and therefore of low export value. The introduction of improved and often cheaper methods through the work of an FAO adviser showed that soft, strong, unblemished hides and skins could be produced. The sales value of these quickly rose, and the demand markedly increased.

FAO's work under ETAP ranges from helping to plan big development schemes, to dealing with a single pest control problem in a valuable crop. In

the first group come the work in Pakistan in the Ganges-Kobadak irrigation-drainage-reclamation scheme, the Gal-Oya irrigation scheme in Ceylon, or the better utilization of the vast Brazilan Amazon forests.

At the other end of the range are such simple, practical projects as the introduction of better small agricultural and forestry tools into countries where unsuitable traditional devices continue to be used. In Afghanistan, farmers have learnt to use modern hoes, spades, forks and scythes instead of sickles, as a result of one such project.

Between the vast and complicated, and the simple project are many others. Pond fish breeding, furnishing valuable food to help overcome the protein malnutrition prevalent in many countries, has been introduced or improved in a number of countries — Haiti, Thailand, Israel, for example. In Iraq and Indonesia, valuable work in nutrition education has been done. Iceland has been advised on sheep disease control, Chile on the elimination of dangerous weeds.

It is apparent that economic and social progress depends upon integrated advancement. A sick farmer is not a good farmer; an undernourished person cannot resist disease, an illiterate farmer finds it harder to learn and use better ways. For this reason, in its work with rural people and with food and agriculture, FAO operates side by side with such other organizations, the International Bank and the United Nations Children's Fund.

It is not only with the work of sister specialized agencies that the work of FAO, especially in the field of technical assistance, is co-ordinated. In the south-east Asia region FAO works in with the Colombo Plan. In this area, also, as in others, there is close co-operation with the U.S. " Point Four " programme. In such cases, the agencies responsible and their local representatives endeavour to work out co-ordinated plans which fit together and strengthen each other, FAO participating toward the great aim for which it was created... to raise the living standards of the needy people of the world by helping them to help themselves.

# THE DETERMINATION OF CRYSTALLISABLE SUCROSE AND ITS APPLICATION IN THE SUGAR INDUSTRY

By

T. FOURMOND (*Felixtow S. E., Natal*)

The aim of this paper is not only to help mill engineers, process superintendents, general managers and directors, to have a clearer picture of sugar mills' efficiencies, but it may also serve the purpose of valuing cane on the basis of crystallisable sucrose available, a method which would be more justifiable for cane evaluation and sucrose distribution.

There are two factors which govern the extraction of sucrose and its recovery :

(a) The fibre content of the cane,

(b) The purity of the juice.

However efficient milling and processing techniques may be, some sucrose will always be immobilised by the fibre of the cane and the impurities of the juice. It therefore stands to reason that sugar mills' efficiencies and cane value ought to be expressed in terms of crystallisable sucrose available rather than in terms of total sucrose.

At present, cane is valued in terms of total sucrose and the only formula available for expressing the total work performed by sugar mills is the overall recovery. This formula however is merely a quantitative expression of relative value as mill extraction and boiling house recovery are closely related to fibre and purity. In other words, the overall recovery does not express the efficiency of the work as cane of low fibre content and of high purity juice is bound to yield a higher overall recovery than cane of high fibre content and of low purity juice. For the same reasons cane evaluation should not be based on total sucrose, as crystallisable sucrose available should also vary according to fibre and purity.

For purposes of comparison, Noel Deerr suggested the reduced formulae which, however, do not represent a yardstick to express sugar mills' efficiencies as no standards are taken into consideration in such formulae. Such formulae have only a relative value as they can only express what a sugar mill would have done instead of expressing what it should have done provided the fibre was 12.5% and the purity 85. Furthermore, the reduced formula cannot lead to the determination of crystallisable sucrose available in cane, which should represent the yardstick for expressing efficiency and purchase of sucrose.

In order to judge the quality of the work performed by the milling and processing departments, one resorts to the lost absolute juice % of fibre and to the boiling house performance, respectively. As these two figures cannot be linked, we are at a loss to express the overall performances by a formula which would express both quality and quantity at the same time, directly as a % of the maximum available in practice and which would also serve as a basis for the determination of crystallisable sucrose available and cane evaluation.

If, to calculate the efficiency of the boiling house, we accept the arbitrary principle (Winter's Coefficient based on practical results) that one part of non-sucrose will immobilise so many parts of sucrose in the molasses, there is no reason why we should not apply the same principle to the milling process by assuming that so much absolute juice will be retained by 100 fibre. We could therefore determine the quantity of crystallisable sucrose available in the cane according to the fibre content and the purity of the juice and from this calculate cane value, milling, boiling house and overall performances.

Obviously we will have to assume a reasonable target for milling efficiency, which will have to be based on practical results. For instance, it is known that quite a few mills have achieved a performance equivalent to some 30 parts lost absolute juice % fibre. This could be taken as the standard at present, until such time as this efficiency is surpassed, and an attempt could be made to calculate the corresponding crystallisable sucrose available.

Although we know that in the milling process, sucrose extraction is higher than Brix or absolute juice extraction, as this is substantiated by a drop of purity between the first and last expressed juices, it would, nevertheless, be rather difficult to calculate theoretically the sucrose extraction corresponding to an efficiency equivalent to 30 parts lost absolute juice % fibre.

From practical results, however, we find that the correlation between sucrose and Brix extractions is highly significant, irrespective of milling efficiency, as is clearly shown by the figures in Table I which represent the average of all Natal mills for the last three decades.

TABLE I

| Year | Lost absolute juice % fibre | Difference between sucrose & Brix extraction | Year | Lost absolute juice % fibre | Difference between sucrose & Brix extraction | Year | Lost absolute juice % fibre | Difference between sucrose & Brix extraction | Year | Lost absolute juice % fibre | Difference between sucrose & Brix extraction |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1925 | 60.7 | 0.76 | 1935 | 54.2 | 0.90 | 1945 | 39.3 | 0.76 | 1955 | 45.5 | 0.81 |
| 1926 | 52.8 | 0.92 | 1936 | 55.6 | 0.89 | 1946 | 40.5 | 0.90 | 1956 | 42.1 | 0.83 |
| 1927 | 58.3 | 0.62 | 1937 | 52.4 | 0.87 | 1947 | 39.8 | 0.91 | 1957 | 40.9 | 0.80 |
| 1928 | 59.8 | 0.76 | 1938 | 53.1 | 0.91 | 1948 | 39.8 | 0.85 | 1958 | 45.6 | 1.51 |
| 1929 | 63.2 | 0.63 | 1939 | 49.6 | 0.88 | 1949 | 41.3 | 0.86 | 1959 | 43.0 | 0.95 |
| 1930 | 57.4 | 0.57 | 1940 | 48.9 | 0.92 | 1950 | 40.2 | 0.71 | | | |
| 1931 | 60.0 | 0.62 | 1941 | 45.1 | 0.74 | 1951 | 40.2 | 0.80 | | | |
| 1932 | 58.4 | 0.70 | 1942 | 45.1 | 0.80 | 1952 | 40.8 | 0.83 | | | |
| 1933 | 55.9 | 0.75 | 1943 | 43.8 | 0.85 | 1953 | 41.1 | 0.80 | | | |
| 1934 | 57.7 | 1.44 | 1944 | 41.1 | 0.87 | 1954 | 44.1 | 0.81 | | | |
| Average for decade = 0.78 | | | Average for decade = 0.88 | | | Average for decade = 0.81 | | | Average = 0.98 | | |

As can be seen, although cane varieties, milling technique and efficiencies have changed much since 1925, the difference between sucrose and Brix or absolute juice extractions remains constant.

It will be noticed that for 1934 and 1958 the deviations are much larger. As all the necessary data for 1934 are not available, the correctness of the figures cannot be checked, but most likely a mistake in the weights of bagasse and Brix would be found. This statement is made because the 1958 figures have been checked and, as expected, an error in such weights has been found, the correct figures for 1958 being :

Lost absolute juice % fibre = 42.3

Difference between sucrose and Brix extractions = 0.85

To confirm the fact that the figures for 1934 must be wrong, we shall refer to the proceedings of the 21st S. A. S. T. A. Congress, where Christianson, in a paper on correlation, omits the figures for 1934 from the conclusions of the statistical results as this particular year appears to be abnormal.

Results from all the other sugar producing countries also show that the correlation is highly significant. Only two deviations are noticed but unfortunately the necessary data are not available for checking.

All countries do not show the same difference, but this can be explained by the nature of the fibre, whether it is natural or made up of impurities such as trash, tops, mud and sand, the efficiency of the imbibition water and the different methods of chemical control. The importance of the analysis of bagasse and last expressed juice in the determination of Brix and fibre is of course well known.

It will be found that the correlation is significant as illustrated in Table II below, which shows the difference between sucrose and Brix extractions for five countries.

TABLE II

| Year | British Guiana | Mauritius | Jamaica | Philippines | Trinidad |
|---|---|---|---|---|---|
| 1952 | 0.04 | 8.71 | 0.00 | 0.50 | — |
| 1953 | 0.01 | 0.71 | 0.00 | 0.69 | — |
| 1954 | **0.53** | 0.91 | **0.36** | 0.59 | — |
| 1955 | 0.00 | 0.70 | 0.00 | 0.72 | 0.46 |
| 1956 | 0.05 | 0.70 | 0.00 | 0.68 | 0.52 |
| 1957 | 0.04 | 0.72 | 0.05 | 0.49 | 0.56 |
| 1958 | — | 0.78 | 0.00 | 0.49 | 0.56 |

Why British Guiana and Jamaica do not show a difference between their sucrose and Brix extractions is difficult to understand, especially as there is a drop of purity between their first and last expressed juices. Any such drop in

purity should correspond to a higher sucrose extraction. This raises doubts as to the correctness of their chemical control.

We can therefore assume that at our present standard of milling technique, sucrose extraction is always higher than Brix extraction and that in South Africa it can be safely approximated at +0.80.

If this is correct, then it is easy to calculate the expected sucrose and Brix extractions corresponding to any efficiency expressed as lost absolute juice % fibre. The purity of the juice being known, the crystallisable sucrose available can be determined for cane value, and the milling, boiling house and overall performances can be calculated.

## CALCULATION OF CRYSTALLISABLE SUCROSE AVAILABLE AT 30 LOST ABSOLUTE JUICE % FIBRE

Absolute juice or Brix extraction, equivalent to 30 lost absolute juice % fibre, can be theoretically calculated in the following way :

$$\frac{(100 - F) - \frac{(F \times 30)}{100}}{100 - F} \times 100$$

where F = actual fibre content.

∴ Expected sucrose extraction, which we shall call

E = Brix extraction + 0.80

A = Tons Brix available

$$= \text{Tons Brix in cane} - \frac{\text{Tons fibre} \times 30 \times \text{Brix absolute juice}}{10{,}000}$$

B = Tons sucrose available

$$= \frac{\text{Tons sucrose in cane} \times E}{100}$$

C = Tons non-sucrose

= A — B

$$D = \text{Purity of juice} = \frac{B \times 100}{A}$$

G = Winter coefficient as rendered by the S.M.R.I.

H = Tons non-crystallisable sucrose = C × G

I = Tons crystallisable sucrose available = B — H

J = Tons crystallisable sucrose in mixed juice as calculated by S.M.R.I. method.

K = Tons crystallisable sucrose in sugar as per S.M.R.I. method.

$$\therefore \text{ Milling performance} = \frac{\text{Tons crystallisable sucrose in mixed juice} \times 100}{\text{Tons crystallisable sucrose available in cane}}$$

$$= \frac{J}{G} \times 100$$

$\therefore$ Boiling house performance

$$= \frac{\text{Tons crystallisable sucrose in mixed juice} \times 100}{\text{Tons crystallisable sucrose available in cane}} = \frac{K \times 100}{J}$$

$\therefore$ Overall performance

$$= \frac{\text{Tons crystallisable sucrose in sugar} \times 100}{\text{Tons crystallisable sucrose available in cane}} = \frac{K \times 100}{I}$$

$\therefore$ Milling, boiling house and overall performances are figures which express efficiency directly as a % of the maximum obtainable in practice. In other words, these figures are at the same time qualitative and quantitative, hence absolute.

Milling performance at 30 lost absolute juice standard can also be expressed in terms of Brix extraction by the following formula :

$$\frac{(100 - F) - 0.01\ FL}{100 - 1.3\ F}$$

When F = actual fibre content and L = actual lost absolute juice % fibre.

It represents a short cut to calculate milling performance, and is a true reflection of milling efficiency as will be explained later on.

For the purpose of sucrose distribution by the Central Board, practical formulae must also be sought. These will involve the Java and Brix ratios. However, as these ratios will also vary with the fibre content of the cane, such ratios will have to be reduced in order to ensure a fair distribution.

From statistical analysis, carried out by the method of least squares, it was found that :

(a) Java ratio varies indirectly to fibre content,
(b) Brix ratio varies directly to fibre content,
(c) Both ratios are highly correlated to fibre content.

The formulae for reducing such ratios can be expressed as follows :

Java ratio = 101.00 — 1.50 (Fibre % cane)
Brix ratio = 42.00 + 2.45 (Fibre % cane)
P = Tons cane crusher juice Brix (C.C.J.B.)

Q = Tons cane crusher juice sucrose (C C.J.S.)

R = Fibre % cane

S = Tons Brix available

$$= \frac{P \text{ (Corrected Brix ratio) } (100 - 1.3F)}{(100 - F)\ 100}$$

T = Tons sucrose available

$$= \left\{\frac{(100 - 1.3F)}{(100 - F)} \times 100 + 0.80\right\} \frac{Q \text{ (Corrected Java Ratio)}}{100 \times 100}$$

U = Tons non-sucrose = S — 7

$$V = \text{Purity juice} = \frac{T}{S} \times 100$$

W = Corresponding Winter Cœfficient

X = Tons non-crystallisable sucrose available = U × W

Y = Tons crystallisable sucrose available = T — X

It must be said that the formulae given for correcting Brix and Java ratios may not apply strictly to every sugar belt as such ratios will also vary with sugar belts, cane varieties, mill 'settings', etc. It is a matter of adjusting the formulae by the required factor for every belt.

In order to illustrate the bearing of fibre content and purity on sucrose distribution, let us us suppose that two farmers each bring 100,000 tons of cane of the same sucrose content but with different fibre content and purity juice.

| | | *Farmer A* | *Farmer B* |
|---|---|---|---|
| Sucrose % | ... | 14.00 | 14.00 |
| Fibre % | ... | 13:00 | 16.00 |
| Purity % | ... | 88.00 | 80.00 |
| Corresponding available crystallisable sucrose | ... | 12,595 Tons | 11.887 Tons |

If the farmers are to be paid on total sucrose, they should both be paid on 14,000 tons of sucrose, but if payment is done according to crystallisable sucrose available, Farmer A would be allocated (12,595 — 11,887) i.e. 708 tons more of sucrose and the miller would only pay for sucrose which is crystallisable. Evidently the price of crystallisable sucrose would be higher than that for total sucrose.

Let us now apply these formulae to some sugar mills' figures for the 1957 season with a view to finding if they are of any value to enlighten us about sugar mills' efficiencies.

| | Empangeni | Tongaat | Natal Estates | Renishaw |
|---|---|---|---|---|
| Mill extraction ... | 90.70 | 94.82 | 95.17 | 94.48 |
| Milling performance ... | 95.83 | 98.92 | 100.30 | 99.41 |
| Boiling house recovery ... | 88.60 | 91.28 | 90.66 | 90.19 |
| Boiling house performance ... | 95.80 | 98.60 | 98.90 | 98.50 |
| Overall recovery ... | 80.36 | 86.55 | 86.29 | 85.29 |
| Overall performance ... | 91.80 | 97.53 | 99.20 | 97.92 |

From the above it is seen that Natal Estates has achieved the best efficiency in both milling and processing, thus ensuring the best overall performance although Tongaat shows a higher boiling house and overall recovery. Renishaw comes second best although Tongaat shows a higher mill extraction and overall recovery. Judging by the recovery standard, one would think that Natal Estates has recovered (86,29 — 80.36) = 5.93 % more sucrose than Empangeni, but the performance standard shows that Natal Estates has recovered (99.20 — 91.80) = 7.40 % more sucrose than Empangeni.

Comparing the figures for the Natal and Mauritius Sugar Industries for 1958, we find that according to recovery standard, Mauritius has recovered (86.91 — 88.11) = 3.80 % more sucrose than Natal. The performance standard however shows that in fact Mauritius recovered only (97.56 — 95.59) = 1.97 % more.

| | Mauritius | Natal |
|---|---|---|
| Mill extraction ... | 95.40 | 92 90 |
| Milling performance ... | 98.84 | 97.70 |
| Boiling house recovery ... | 91.10 | 89.49 |
| Boiling house performance ... | 98.70 | 97.84 |
| Overall recovery ... | 86 91 | 83 11 |
| Overall performance ... | 97,56 | 95.59 |

Such figures could be misleading to the layman if he had to correlate mill extraction with fibre content and boiling house recovery with purity of the juice. With efficiencies expressed as milling, boiling house and overall performances even the ordinary layman would understand that the higher the figures, the higher is the efficiency as they express efficiency directly as a % of the maximum obtained in practice.

A pertinent question which could be put by mill engineers is the following : Is milling performance a true reflection of milling efficiency seeing that Brix and purity are taken into consideration ? This could be rather misleading to people who are not sugar technologists, but actually it is a true reflexion of milling efficiency as shown per calculation for the 1957 season.

Expected sucrose extraction as per formula = 95.35
Actual mill extraction = 93.36

∴ Milling efficiency expressed in terms of ordinary sucrose

$$= \frac{93.36 \times 100}{95.35} = 97.91\%,$$ which corresponds to the actual milling performance of 97.94% expressed in crystallisable sucrose and to milling performance of 97.90% when expressed in Brix.

We can therefore conclude that milling performance is a true reflection of milling efficiency.

Is there any necessity, then, to formulate such expressions as milling and overall performances ? Some sugar technologists may consider that lost absolute % fibre and boiling house performance or that the Noel Deerr's reduced formulae are good enough data to express sugar mill's efficiencies. However, if we consider that the entire staff of sugar mills and those connected in some way or other with the sugar industry, are not necessarily sugar technologists, then we must admit that the performance standards are far more logical and easier to understand as they express quality and quantity at the same time.

Furthermore, cane at present is valued on the basis of total sucrose, irrespective of the fibre content and of the purity of the juice. This does not seem to be a justified method for cane evaluation and sucrose distribution

Should cane be valued on the crystallisable standard, both millers and farmers would benefit by it. Under the present conditions, we know that canes delivered at the mills also contain trash, tops, roots, mud and sand and are very often deteriorated from over-exposure to climatic conditions. Under the crystallisable sucrose basis farmers would see that only clean and fresh canes are delivered.

It would also be an incentive for our geneticists to breed canes of low fibre content and of high purity juice and the farmers would also adopt better methods of farming to achieve the same results. The farmers would also benefit as they would be carting less impurities and in this connection it should be remembered that transport is the most expensive item in the cost of cane production.

Every sugar producing country is trying hard to reduce the costs of sugar production, not only with a view to competing on the world's sugar market but also in an attempt to increase sugar consumption.

It is being conservative to say that, should only clean and fresh canes be milled, the fibre content would be lowered by some 3% and the purity of the juice would be raised by some 2%. (*The Topping of Cane in Mauritius*, by S. Staub, Proc. 29th S.A.S.T.A. Congress). This would result in a higher overall performance of some 3% representing some 40,000 more tons of sugar or some £ 1,250,000 a year more for the Natal Sugar Industry. Furthermore, the throughput per hour would be appreciably increased without the need of addi-

tional machinery, thus shortening the crushing period and giving the opportunity of taking advantage of the peak period of cane maturity ; and there would also be appreciable savings in the wear and tear of the machinery.

To value the cane on the basis of crystallisable sucrose, a practical method for fibre determination of individual farmers' cane is necessary. Should all sugar mills be fitted with shredders, wouldn't it be possible to carry out fibre determinations on shredded cane ?

For all the above reasons, it appears that there is justification to investigate the possibilities of introducing individual fibre determinations and in introducing such expressions as milling, boiling house, and overall performances into our chemical control.

## SUMMARY

The author suggests that investigations be carried out to determine crystallisable sucrose in cane with a view to evaluating cane on such a basis, as this would automatically bring the efficiencies of sugar mills up and the cost of production down and the farmers would also benefit by such a scheme.

He also suggests that formulae, such as the milling, boiling house and overall performances should be brought into our chemical control as they would be better yardsticks to express mills' efficiencies.

From practical results, he shows that there is a close correlation between sucrose and Brix extractions, and the expected sucrose extraction ,calculated from such a principle, makes the determination of crystallisable sucrose quite easy and accurate.

# SOIL EROSION IN MAURITIUS

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## Introduction

It is often thought that soil erosion is not a problem of any importance to agriculture in Mauritius. This feeling can be very dangerous when the history of erosion in other countries is considered. Failure to foresee erosion often leads to people closing their eyes to the first symptoms, thus allowing this disease condition to obtain a firm grip on the land. Once this has occurred, cure can be extremely difficult and expensive. It is the intention of the writer to draw attention to early symptoms which are already apparent in Mauritius in the hope that all concerned will look closely at their own lands and take every precaution to ensure that erosion does not prejudice the future of their properties.

Indications of erosion are easily seen in many parts of Mauritius. The gullying of certain parts of the upper slopes of the Port Louis range of mountains is sufficiently severe to warrant immediate remedial action. The catastrophic floods of November 1959 in the North of the island indicated inadequate water control in the watershed areas. The very rapid rise and fall of the rivers following even minor rainstorms gives proof that water retention in the land is very small. Cloudbursts or local torrential thunderstorms give the highest rate of precipitation and are the main cause of physical soil loss through erosion. The discoloration of streams and rivers after heavy rains is caused by a suspension of soil material being carried away from the land to be deposited in estuaries, lagoons and even far out to sea. No country can long sustain this wastage of soil wealth and it is the duty of everyone to recognise that erosion is an ever-present risk, and to take every precaution to stop this wasting away of the Island's only natural resource.

In this paper the long-term problems of erosion are discussed, and some information given regarding the various forms which soil erosion may take. It is not intended to give a detailed account of erosion in Mauritius but rather to bring to the attention of the farming community that erosion is already present in the Island and can assume greater proportions unless early action is taken to conserve the soil.

## The economic problems of soil erosion

Soil erosion is not simply a minor loss of soil from farming lands. The economic problems caused by erosion are widespread, and in extreme cases can jeopardise the whole economy of a country. It has been estimated that the productive capacity of the Republic of South Africa has been reduced by about 30% within the past century purely by the effects of soil erosion (1). In China, it has been calculated that the Yellow River annually carries 2,500,000 tons of soil

away from the land into the sea. In the United States of America, some 2,000 million dollars worth of plant foods are lost to the ocean each year. These figures may appear to be startling but are representative of countries far removed from Mauritius. It is however increasingly evident that similar losses are occurring in the island although not as yet in such vast proportions. Already certain areas of land are being so severely affected by bad management and lack of soil conservation that their productive life cannot be extended for many more years. Soil erosion is an individious disease of the land which often does not manifest itself in obvious ways, and is often only found when it is too late to remedy the severe loss of fertile soil

Not only does soil erosion cause loss of productive land by direct erosion, but it also can materially affect the water supply of the country by increasing runoff of rainfall water, and by the siltation of water supply reservoirs. With the rapid increase in population in Mauritius, this may well become a critical factor in the future of the island. This pressure of population will show its effect in the increasing intensity of cropping on the available fertile soil, and unless this is carefully studied, and every endeavour made to ensure adequate husbandry and conservation measures on such lands, may rapidly increase the degree to which erosion affects the food supply and economy of Mauritius.

The very existence of the people of this country may well be dependent on the recognition that soil erosion is an ever present menace to life, and unless adequately controlled may lead ultimately to the complete denudation of the agricultural economy of Mauritius. It is not intended to infer that this problem is the only limiting factor in agricultural production, or that it is within the next few years that the extreme conditions will become apparent, but it must be remembered that the soil is the prime inheritance of the future generations of Mauritians, and if the early signs of erosion risks are ignored, then the control of erosion in future years may be physically impossible. In common with every human disease, it is essential to give erosion early treatment if the future recovery and stability of the nation's main resource is to be ensured.

**What is soil erosion ?**

Soil erosion has been defined as " the accelerated removal of fertile soil " (1) Under natural conditions, the earth's surface is subject to continual but usually extremely slow change. The rugged peaks of geologically new mountain ranges are steadily reduced by processes of wind and rain, heat and cold to the smoothly rounded hills and valleys of the more mature sections of the earth's crust. This process is always taking place, and even under the most ancient geological areas where apparent stability has been achieved, the slow removal of senile soil from the surface of the land, and its replacement by soil formation from the parent rocks beneath, is a permanent form of natural erosion. These processes of natural erosion are often referred to as *denudation* or *geological erosion*. This can readily be seen in Mauritius especially in the steep lands of the mountain ranges and gorges where soil slip is common. This is the falling

away of large sections of a hill-side carrying with it the sub-soil, the surface soil and the overlying vegetation. It is in this way that nature tries to reduce the craggy mountains and to form a gently undulating topography by the process of eroding the steep high mountains and depositing the products of this erosion at lower levels gradually filling up the valleys.

Soil erosion occurs when, due to man's interference with nature, this removal of senile soils and slow levelling of mountains becomes so accelerated that all the fertile soil is carried away and lost in the sea. Climate as such is not the cause of soil erosion. Where man has not intruded into a land, the vegetation, soil, topography and climate work hand in hand to produce a stable surface to the earth. This mantle is permanent and all the actions of the elements are self-cancelling, thus forming a *status quo* with the slow process of geological erosion continuing to prevent the complete senility of the earth. It is entirely due to the inept hand of man that soil erosion creeps in to cause calamitous breakdowns in the rotation of nature and the consequent ruination of vast areas of land. The uncontrolled clearing of natural vegetation, the intensive cropping of the land, and bad agricultural practices allow the various elements to become unbalanced. The effect is usually catastrophic, and the rains, once broken by natural vegetation, and absorbed by the open-textured, fertile soil is allowed to lash the impoverished and unprotected soil thus causing soil erosion on a vast and increasing scale.

Evidence of man's interference with nature is to be seen in the Sahara Desert which in Roman and Carthaginian times was the granary of the ancient world. The deserts of Asia Minor, Persia, Mesopotamia and China are also relics of man's attempt to conquer nature and show strikingly that man has dismally failed. All the newer settled areas of the world — America, South Africa and Australia — have shown that man cannot battle with nature with any hope of success. In all these countries, soil erosion was rapidly on the scene, and in many cases has caused the complete abandonment of what were once rich and fertile lands. It is only due to the recognition of soil erosion as a major limiting factor to agricultural production that these newer countries are now coming to meet nature with the required knowledge and with sufficient humbleness to her strength, and are farming the lands with the full knowledge that soil conservation is essential to the future stability of the land.

The physical process of erosion is extremely complex and there is still much to be learned. The susceptibility of any area to erosion is dependent on factors of soil type, vegetable cover, fertility of the soil, especially in relation to the organic matter content of the soil and the intensity and duration of the wind or rainfall whichever is the cause of the erosion. An open, light soil without vegetation subjected to high winds will start to erode. The smaller and usually the most valuable particles of the soil will lift into the wind and be carried along. These then give greater power to the wind, and larger particles are collected until a vast dust storm may develop carrying with it thousands of tons of soil and dropping this sometimes hundreds or even thousands of miles

from the original site. An open soil without cover receiving a heavy downpour of rain will absorb the water to its full capacity, but once full will shed any further precipitation by allowing it to run over the surface of the soil. This surplus water is highly erosive and is termed *run-off*. The run-off water carries with it the smaller lighter soil particles and dependent on the quantity and the degree of slope of the land will cause severe soil losses if not controlled. The soil-carrying water runs over the land to natural drainage lines and thence to the streams and rivers and so to the sea. The erosion debris may be deposited along the river bed, reducing the capacity of the stream and thus leading to flooding. It may be carried into water storage reservoirs and there reduce or even completely fill the water storage capacity of the reservoir. Carried out to sea, the debris may silt up harbours, cause dangerous shoals and bars, and often severely deplete the coastal waters of fish.

These extreme results may appear far away from conditions in Mauritius and fortunately this is in fact so, but they have occurred and are occurring in many parts of the world to-day, and unless the terrible results of severe erosion are appreciated, then it is unlikely that the people of Mauritius will bother to look really critically at the current practices which are inevitably leading the island to such an end unless prevention is started at an early date.

**Types of erosion**

Soil erosion may take many forms, some obvious and spectacular and others very rarely recognised and yet often the most serious. The types of erosion are usually classified into the various forms which they assume, and also by the cause of the erosion. It is important that all people dealing with the land whether large estate owners or operators, or small vegetable growers should be aware of the various forms which erosion may take, and be able to recognise the symptoms and know the main causes of the erosion damage.

(a) *Wind erosion* — This form of erosion is not commonly of any major importance to Mauritius at the present time, but the small "dust-devils" or *tourbillons* which are a common sight at certain times are reminders that this form of erosion can attain vast proportions under some conditions of agriculture, climate and topography. The small whirlwinds seen locally lift up dust and loose vegetable matter and carry these away. It is fortunate that they are of very small size, and soon disappear with the small quantity of soil carried dropped not too far away from the original site. A more serious form of wind erosion may be seen after cyclones. It has been seen in Mauritius and in Rodrigues that the extremely high wind velocities during cyclonic periods can carry large quantities of soil away from open fields depositing the debris into drains, and irrigation canals. The extreme abrasive action of this wind-carried soil material was amply demonstrated in 1960 in certain exposed tea plantations. Here, the plants were virtually sand-blasted to bare, bark-lesss stems during the cyclones of early 1960.

Another aspect of this form of erosion in Mauritius is the risk of sand

dune encroachment especially in the East and South-East areas of the island. The denudation of many areas of the Pas Geometriques tree plantations may give rise to encroachment of the beach sand carried by the trade winds on to productive land previously protected from this danger by the Filao plantations. This form of wind erosion can become extremely serious, and this factor should be borne in mind when planning the cropping of the Pas Geometriques.

(b) *Water erosion* — The action of heavy falls of rain on exposed soil is well known to everyone. All soils have a capacity to absorb water precipitated, but once the soil becomes saturated, then the water falling will run off the surface of the soil carrying with it the small and valuable soil particles. The culmination of this action is very varied. In some cases, whole layers of top-soil are removed, and this is termed sheet erosion. In other cases dependent often on soil and subsoil types, and on topography of the land, the effect is the more spectacular scouring of trenches or gullies. This is termed rill or gully erosion dependent on the severity of the process.

(i) *Sheet erosion* — This form of erosion is one of the most difficult to diagnose. The gradual removal of topsoil from a field is not readily seen with the eye, and the much repeated system of driving a stake into the ground and measuring soil loss has never given reliable results. One method which may be used to assess this form of erosion is to construct with an ordinary 1" board a small dam across the slope of the land. The board may be some 4 to 8 feet long with cross p eces nailed to each end giving the form of an 'I'. This board is then securely pegged onto the ground across the slope ensuring that water cannot escape below the board. If this board dam is examined after any appreciable rain, it will often be seen that the soil has been washed into the dam and will show a sediment deposit which indicates that erosion is in fact at work in the field. This form of erosion may readily be seen on fields where the cane lines are set up and down the slope, and also on fields recently cultivated and left bare. Sheet erosion may rapidly denude the field of all its fertile topsoil, leaving exposed the very infertile subsoil, or even bare rock. It is this form of erosion which causes the so-called 'rising up' of rocks in the field. The effect of rising is given by the gradual sheet erosion of the soil around the rocks which were previously buried in the soil. Some effect of this kind is of course seen where the soil is left in a rather open structure after cultivation. This open soil will settle with the first few rains thus exposing the partly buried rocks and giving the appearance of 'rising-up'. This, however, does not explain the uptifting of rocks continuously over the several years that a field is under continuous cane cultivation. Sheet erosion is without doubt present in Mauritius, and urgent attention to contour planting and other control measures is imperative.

(ii) *Rill erosion* — This is the next step from sheet erosion and is very common in open cultivated fields in the island. In this, after a heavy rain-storm on exposed soil, small gullies or rills are washed in the soil. These may be only a few inches wide and deep, and are often cultivated in and forgotten. The soil loss from this form of erosion can be severe, but is only a little more obvious to

the eye than sheet erosion. The problem is largely kept in check in Mauritius by the virtue of the sugar cane crop. With this crop the soil is only fully cultivated and exposed to rill erosion once in every six or seven years and this is a great advantage. It should however be realised that even at the rate of once in seven years, the cumulative effects of losses of soil from this cause may well be serious to future generations.

(iii) *Gully erosion* — This is erosion in its most violent and spectacular form. Fortunately for the island, this form of erosion is limited at present to a few areas only. Gully erosion has been and is the most virulent killer of farming land and public utilities throughout the world. Roads have been washed away, dams torn asunder, millions of acres of land rendered useless by this active soil disease condition. Gully erosion is not only man-made. The deep gorges and valleys of the main rivers especially those flowing to the West and South of the island are products of geological gully erosion. These form part of nature's evolution, and are largely irresistible. The man-made forms of gullying are less immense in Mauritius, but can readily be seen in many parts of the island. The cropping of excessively steep lands, the clearing of natural flood water channels, and the bad design and alignment of field and road drains all play their part in the formation of gullies. Once gullying has started, it is very difficult and costly to control, and as in all other forms of erosion, prevention is better than cure. Where gullying has reached major proportions, the only remedy is to abandon the area, and after applying all necessary mechanical remedies planting the area up to trees or bush in order to stabilize the remaining soil, and clog the highly erodible gullies.

A gully has been defined as an eroded channel too large for normal farm machinery to cultivate across. Another definition is a newly eroded channel at least 18" wide, and 10 and 12 inches deep (2). In forest areas, a gully may be described as a newly eroded channel deep enough to expose the main lateral roots of large trees. Gullies are formed in various shapes usually according to the nature of the soil and sub-surface horizons of the area affected In a shallow soil with an erosion-resistent sub-soil, the gullies may be wide and shallow, with numerous laterals developing from the sides. These are sometimes termed *lateral extension gullies*. Where the underlying material is of a light sandy or gravelly nature the gullies take on a straight sided and flat bottomed form. These are termed *U-shaped gullies*, and often remain as a single water course without much branching or corkscrewing. In most soils, the gullies form a rough V section with sloping sides and narrow bottoms. These are termed *V-shaped gullies*. This form is the most common, and often meanders considerably due to a corkscrew effect of the water being deflected from one side of the gully to the other, and cutting into the back, wherever it is deflected. This form of gully often forms extensive areas of branched, twisting water channels and is very difficult to control.

In all cases, regardless of the ultimate form of the gully, the prime cause is the uncontrolled waterfall at the head of the channel. This waterfall causes

the cutting of the soil and substratas and allows the gully to encroach onto land above the initial gully. Lateral flows of the water fall into the existing gully, and gradually start to form a lateral gully which cuts back into new land and this in turn may start to branch, thus giving the widespread damage so typical of this form of erosion.

(c) *Stream bank and beach erosion* — This is a very important section of erosion in Mauritius. It is often thought that because a stream reaches a bed of solid rock, or dense boulders, that it is then static and safe for all practical purposes. In many cases this is indeed true, but one can often see places where streams are not being effectively controlled in this way. With the increase in cultivation of all kinds in the upper reaches of the stream and rivers, the rate of flow of the old streams is being increased owing to increased run-off and less water retention in the highland areas. The erosion of stream banks is definitely on the increase, and the early correction of this is important. The natural stream bed is in most cases at a level of solid rock or concentration of boulders. These usually effectively prevent any further deepening of the river or stream bed, but in no way prevent the sideways or lateral spread of the water. The tendency of the stream to meander from one side of the bed to the other becomes greatly exaggerated in the intense flooding which often accompanies heavy rainstorms, and the force of the water will cut into and under the bank thus causing subsidence of the surrounding soil. This fall blocks part of the stream, and in turn diverts the water to the opposite bank where undercutting again starts. This repeated over a series of storms can rapidly cause great losses of fertile land along the banks of the streams. The stream and river reserve lines do much to prevent this action by ensuring that the banks are well planted with trees and shrubs the roots of which bind the soil of the bank and resist this form of erosion, but in many cases, even this protection has been shown to be insufficient to withstand the enormous strength of flood waters. The revetting of stream banks or other methods of controlling this erosion are expensive operations, and may well be neglected for this reason. The constant attention to this form of erosion, and the necessary small repairs to stream banks can often prevent the need for the expensive operations which would be required should the problem be ignored as being unimportant.

Beach erosion was readily apparent after the two cyclones of 1960 where in many cases almost 100 feet of beach was completely washed away by the huge seas raised by strong winds. This outstanding example of beach erosion should not be considered as isolated cases only occurring during cyclonic weather. The gradual erosion of beaches around the island is happening all the time. Each tide causes some minor change in the beach line both erosive and in the depositing of new sand bars and banks. This gradual change only affects the lands immediately adjacent to the beaches, but the owners or lessees of such land will be directly concerned with this form of erosion. The breaking through of the sea through the coastal sand barriers can often cause damage to low-lying fertile land behind the beach, and the protection against this should be a matter for careful consideration by all interested parties.

**The national aspects of soil conservation**

The very complex and detailed methods of achieving control of erosion in all its aspects cannot be gone into in this paper, but the general principles should be made known. The importance to the nation of soil erosion control cannot be over-emphasized. It is useless to carry out expensive conservation measures on one piece of land if the neighbouring owners or tenants are not willing to cooperate and assist in the work. Where several owners are concerned in a watershed area, then in order to plan a comprehensive and safe method of erosion control it is necessary for all the parties to be included in the scheme. The acceptance of water from a neighbour's land, and the facility of passing surplus water to the next land owner below in the watershed are essential parts of a regional conservation scheme. This cooperation can be achieved by propaganda, and the making aware to all concerned of the dangers of erosion is the first step in any scheme for soil conservation. It is unfortunate, however, that on many occasions, a small minority of land owners will not be convinced of the need for conservation. It is in this circumstance that it is necessary to formulate some form of soil conservation legislation. In all the countries where soil erosion is a menace to the economy of the country, and in many where the danger is only potential, some form of ordinance is on the Statute Book to ensure that the individual may have protection for his lands from damage occasioned by the malpractices of his neighbours. In some countries, the authority of the legislation is devolved upon local conservation committees where the farmers or planters themselves see to the adequate control of erosion in the area. This is a very useful form of control since each man is directly concerned with the upkeep of conservation works, and the control of agricultural malpractices which may endanger the land in the area. Such committees are at liberty to call for technical guidance from a soil conservation authority usually forming part of the country's agricultural advisory services. Enforcement, however, is retained by the people most concerned—the growers themselves.

**Soil conservation methods**

The basic preventative, and in many cases the method of treating existing soil erosion, is one of improved agricultural practices. The planting of erosion resistant crops, the maintenance of the soil in a state of high fertility are both prime factors in erosion prevention and control. Poor land, badly managed is the main menace to the soil in any area, and even if not causing erosion directly, is providing the ideal conditions for erosion to occur during times of excessive rain such as torrential thunderstorms, or cyclones. Thus it will be seen that, as in any form of illness, prevention is better than cure. If, however, erosion has already gained a foothold in the area, then more direct methods have to be resorted to. Where sheet erosion is present, then cultural practices such as contour planting, the growth of cover crops, the banning of crops especially subject to erosion and other similar remedies may be used. Where gully erosion in some form or another has started, it is often necessary to erect dams or barriers in the gullies, construct cut-off drains to divert water from the gullies onto less susceptible lines of drainage, and to plant the gullied areas into trees, shrubs or permanent cover crops.

The control of stream bank erosion is again one where once the stream has got out of hand, then the measures necessary for control become more expensive and difficult. There are many methods used by soil conservationists for this work, including the revetment of banks, pegging down of brush bundles on the banks after sloping off to a stable angle, and the planting of bank-holding trees and shrubs. Beach erosion can be controlled by protective planting of shelter belts of trees and shrubs, or in some cases by the use of salt-tolerant trees such as mangrove. Where sand has already invaded the land and drifting sand is likely to cause further damage the planting of special grasses may be required to anchor the sand dunes and protect them from further spread by wind.

Whatever the form of erosion being attacked, it is essential that the technical knowledge of the work on hand is fully understood. The temporary plugging of incipient gullies with brush or rocks invariably results in the worsening of the position since unsatisfactory and badly designed structures cause the water to be diverted, and the gully to become enlarged often to such a degree as to make the future control of the gully almost impossible. Similarly, the misuse of contour planting, or badly laid out contours, may cause a worsening in the erosion of the area rather than an improvement. The incorrect siting of roads can lead to severe erosion conditions and in Mauritius has often done so. The care needed in this type of work cannot be overemphasized, and the study of this aspect of agricultural production should be part of the education of every planter and landowner. Each and every part of Mauritius has its own special problems as far as erosion is concerned. In the drier areas, soil conservation is inevitably linked with water conservation, whereas in the super-humid uplands the problem is often to achieve soil conservation with an adequate and safe drainage of surplus water from the cropping lands. All these problems require careful and detailed study, and the interest and active participation of landowners and cultivators is essential if the problem of soil erosion in Mauritius is to be kept to a minimum, and if the future generations of the population are to be assured of a rich and productive soil as their inheritance.

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# NOTES ON SEPTORIOSES OF PLANTS IN MAURITIUS

by

S. FELIX

The Genus *Septoria* Saccardo belongs to the Sphaeropsidales, a group of the Fungi Imperfecti having spherical or oval fructifications or pycnidia containing the spores (Plate I). The dark pycnidia of *Septoria* species generally occur on leaves and are open by an ostiole when mature. Spores are hyaline, elongated and generally with transverse septa. Some species have been found to be conidial stages of Ascomycetes such as *Mycosphaerella* or *Leptosphaeria*. It is somewhat difficult to differentiate between the numerous species on the basis of pycnid and spore dimensions only. The species which are of economic importance in Mauritius being specific and only one species being known to occur on a particular host, it is believed that a description of the symptoms may help in identification.

Septoria leaf spots, if diagnosed early, may generally be controlled successfully with copper fungicides or dithiocarbamates. They may also be prevented by using clean or disinfected seeds.

The following complete up to date list of 17 *Septoria* species from Mauritius includes reference number of Herbarium specimens kept in the Division of Plant Pathology, localities and date of collections.

*Septoria apii* Chester on celery (*Apium graveolens* L.)
D/431, St. Pierre, 26.8.59, Felix.

*Septoria dianthi* Desm. on carnation (*Dianthus caryophyllus* L.)
D/34, 1938, Wiehe.

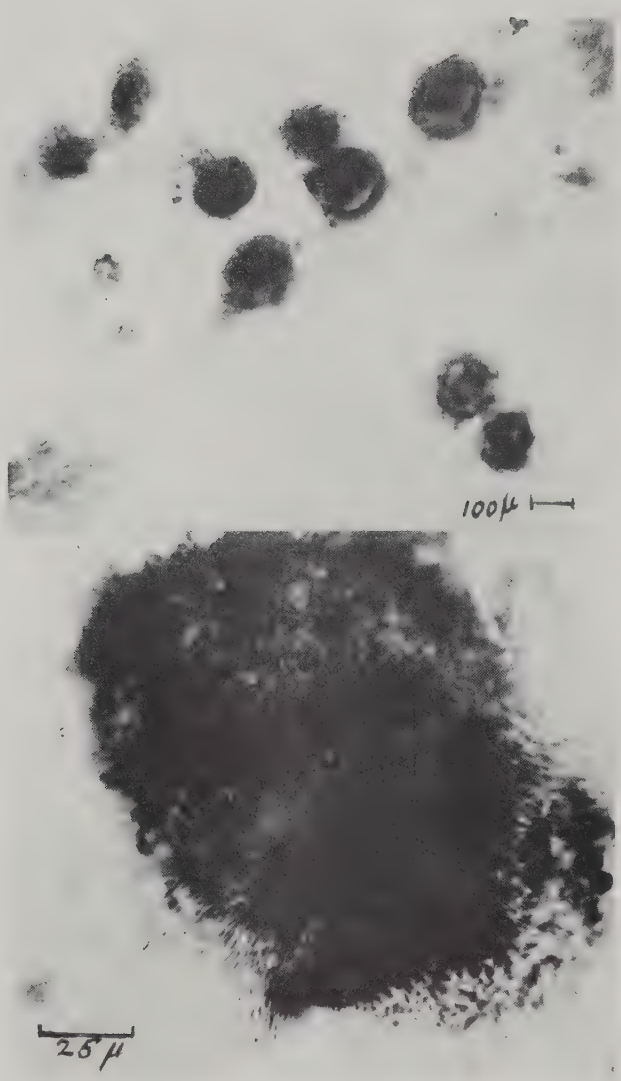
*Septoria gerberae* Syd. on Barberton Daisy (*Gerbera jamesonii* Hook.)
D/208, Rose-Hill., April 1940, Duhamel.

*Septoria gypsophilae* Died. on *Gypsophila* sp.
D/328, Quatre Bornes, June 1958, Felix.

*Septoria lactucae* Pass. on lettuce (*Lactuca sativa* Linn.)
D/433, Quatre Bornes, 21.8.59, Orieux.

*Septoria lycopersici* Speg. on tomato (*Lycopersicon esculentum* Mill.)
1957, Shepherd.

*Septoria nesodes* Kalchbr. on "Herbe Boileau" (*Hydrocotyle asiatica* L.)
D/51, 1937, Shepherd.




Top: Pycnidia of Septoria apii on Celery.

Bottom: Pycnidia and spores of Septoria lycopersici on Tomato.

*Septoria petroselini* Desm. on parsley (*Carum petroselinum* Benth & Hook.)
D/412, Beau-Bassin, 25.7.59, Felix.

*Septoria phlogis* Sacc. & Speg. on phlox (*Phlox sp.*)
1937, Shepherd.

*Septoria rubi* Westend. on raspberry (*Rubus idaeus* L.)
D/295, Curepipe, Sept. 1957, Orian.

*Septoria sonchifolia* Cooke on "lastron" (*Sonchus oleraceus* L.)
DR/16, 1960, Rodrigues, Orieux.

*Septoria* sp. on cinnamon (*Cinnamomum zeylanicum* Nees.)
D/26, Wiehe.

*Septoria* sp. on Ravenal (*Ravenala madagascariensis* J. F. Gmel.)
D/87, Wiehe.

*Septoria* sp. on "Herbe Bol" (*Hydrocotyle banariensis* Lam.)
D/462, Vacoas, Dec. 59, Thatcher.

*Septoria* sp. on *Chrysanthemum* sp.
D/495, Beau-Bassin, Oct 60, Felix.

*Septoria* sp. on starburr (*Acanthospermum hispidum* DC)
D/471, Reduit 1960, Felix.

*Septoria* sp. on cabbage (*Brassica oleracea* L.)
D/452, Riv. des Anguilles, 21.8.59, Orieux.

**Description of noteworthy species**

*Septoria apii* Chester.

This species is responsible for a blight of celery and frequently causes severe losses in Mauritius. The leaf spots which occur on both leaf surfaces are round or angular. They start as light yellow areas which gradually turn brown, later on whitish.

Pycnidia 65-95 microns ; spores 0-4 septate, filiform, straight, 13.5-84.2 x 1-2.5 microns.

A different species, *Septoria apii graveolentis* Dorogin, causing a smaller leaf spot, is reported to be much more injurious. It has not been observed to occur in Mauritius.

*Septoria dianthi* Desm.

This fungus causes a major disease of carnations in Mauritius. It attacks

leaves, stems and inflorescences, causing light brown spots with a purple margin. The lower leaves are first attacked and the disease gradually spreads upwards particularly under high moisture conditions. There is sometimes a marked discoloration of attacked stems and leaves. Diseased leaves wilt and hang down, rendering the plants unsightly.

Pycnidia : round 125 microns diam. Spores, cylindrical, flexuous, 50-40 x 3-4 microns.

*Septoria gerberae* Syd.

This fungus causes a defoliation disease of *Gerbera*. Purplish patches occur on the leaves especially along the margins. Affected leaves are killed and hang on to the plant.

*Septoria gypsophilae* Died.

This species has been observed to be destructive on *Gypsophila* plants. Brown spots up to 4 mm. occur on both leaf surfaces.

Spores cylindrical 2.5 x 15-25 microns.

*Septoria lactucae* Pass. (Plate II).

This species, of recent introduction into Mauritius has been found to be destructive under humid conditions, the plants being dwarfed and unsightly. Lower leaves are first attacked. The angular to irregular spots are brown, gradually turning white in the centre, with a reddish margin. The spots may coalesce to form larger necrotic areas. The disease is more severe late in the season and particularly on crops grown for seed production.

Pycnidia 65-145 microns. Spores 29-43 x 1.5-3 microns.

*Septoria lycopersici* Speg.

This disease is occasionally important on tomato. It first appears on old leaves as small pale circular spots with greyish central areas on which the pycnidia are found. Symptoms also occur on stems and petioles. In advanced attacks leaves shrivel up and may hang from the plants.

The spores are 3-11 septate, filiform 70-100 x 2-3 microns.

*Septoria petroselini* Desm. (Plate II).

This fungus causes the most important disease of parsley in Mauritius and is sometimes very destructive. The spots are at first small brownish-grey surrounded by a yellow halo. They later turn almost white. They often coalesce to form larger patches particularly in wet conditions.

Pycnidia 100 microns diameter. Spores filiform, straight or flexuous 30-40 x 1-2 microns.

PLATE II.

Septoria sp on Chrysanthemum. Septoria petroselini on parsley. Septoria lactucae on lettuce.

*Septoria phlogis* Sacc. & Speg.

This fungus causes the common blight of *Phlox*. Pale-brown circular spots are first formed on the lower leaves which drop down prematurely. Older spots are whitish with reddish-brown margins. The plants are stunted and the period of flowering is considerably reduced.

Pycnidia spherical, 100-200 microns. Spores filiform or slightly curved, 1-5 septate, 40-60 x 1-2 microns.

*Septoria rubi* Westend.

This fungus is responsible for a defoliation disease of raspberry. The spots are light coloured with a red margin. The pycnidia are very small. Spores 3-4 septate, elongate, 40-50 x 1.5-2 microns.

*Septoria* sp. (Plate II).

A *Septoria* species is occasionally destructive on *Chrysanthemum* in Mauritius. The symptoms may be confused with nematode injury. The spots are shrunken, brown to black with a pale centre. They occur particularly on the lower leaves which hang loosely from the plants. Diseased plants are stunted.

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# LES INSECTICIDES

par

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Nous voudrions dans cette causerie parler rapidement de quelques insecticides nouveaux pouvant être utilisés avec succès dans nos cultures contre les divers parasites qui se manifestent le plus à Maurice, surtout au cours du mois d'août.

Cette année, d'après le manuel du Dr. Frear sur les pesticides en usage en Amérique, l'agriculteur peut avoir à sa disposition près de 9,500 produits antiparasitaires contre environ 7,000 l'année dernière. L'augmentation est donc de 2,500. On peut s'attendre à ce qu'une vingtaine de ces pesticides au moins trouvent emploi à Maurice.

Cette semaine même, nous avons commencé une série d'essais avec un aphicide nouveau appelé « Sayfos » ou « Mézanon » Les résultats font voir déjà que ce nouveau produit, qui est heureusement de faible toxicité pour l'homme promet de surclasser d'autres produits déjà en usage contre les aphis. Hier encore, nous recevions d'Amérique un appât empoisonné au « Vapona », qui, posé dans une soucoupe dans un coin de chambre ou d'étable, peut attirer et tuer des centaines de mouches.

Notre rôle est précisément de choisir parmi cette légion de produits antiparasitaires ceux qui tout en étant efficaces contre les insectes, présentent peu de danger à l'humain ; et si l'on ne peut se passer de corps toxiques, il nous faut alors en contrôler l'emploi.

Pour aider ceux que la question intéresse, la Division d'Entomologie du Département d'Agriculture a préparé un résumé des essais de pesticides faits à ce jour et dont l'efficacité contre les ennemis des cultures a été confirmée. Cette liste sera communiquée aux agriculteurs qui en feront la demande. Il faut noter qu'il n'y a pas intérêt à dépasser les concentrations indiquées ; les doses beaucoup plus fortes employées par quelques maraîchers ou autres cultivateurs peuvent nuire à la végétation et rendent les traitements très onéreux.

Les *arbres fruitiers* ayant beaucoup souffert des derniers cyclones, nécessitent des soins tout parliculiers. Sur les branches et les troncs des manguiers on constate en ce moment des foyers de larves d'un coléoptère longicorne : le *Batocera rufomaculata*. Pour préserver les jeunes manguiers on trouvera utile de faire un épandage de dieldrin tous les deux mois et de rechercher les larves sur les vieux manguiers. Sur les feuilles

*Causerie radiodiffusée le 11 août 1961.

du manguier les foyers toujours nombreux de cécidomyies nécessitent des traitements réguliers au dipterex ou au chlordane. On peut aussi y constater la présence d'une cochenille appelée : *Aulacaspis cinnamoni*. Ici, aucun traitement par insecticide n'est à recommander. Le laboratoire d'entomologie de Réduit fournira, toujours sur simple demande, des déprédateurs, en l'occurrence des coccinelles qui tiendront ces cochenilles en échec.

Sur les agrumes, un insecte, le *Flatopsis nivea*, ressemblant à un petit papillon blanc, mais qui est en réalité un hémiptère homoptère de de la famille des Fulgorides, est très abondant. L'orthodibrom est efficace contre cette peste.

Contre les pucerons noirs qui sont abondants en ce moment il faut pulvériser au rogor, au sayfos, à l'orthodihrom ou au dimécron.

Contre la cochenille rouge et autres cochenilles des agrumes, se servir du murphotox huileux. Il faut s'abstenir de traiter pendant les journées chaudes. Contre les cochenilles farineuses de l'ananas, il faut 2 traitements mensuels, pendant 4 à 5 mois, à l'endrin ou au phosdrin sur les plantations envahies. Pour réduire les colonies de *Dysmicoccus*, la lutte contre les fourmis qui entretiennent cette cochenille est très importante. Nous en reparlerons.

Le bananier est très susceptible aux attaques du charançon *Cosmopolites sordidus*... Un poudrage général du sol et des souches au dieldrin est indiqué. Il est utile également de ramasser régulièrement tous les débris végétaux de souches ou de pseudo-troncs et de les faire incinérer.

Sur le jujubier, la présence de charançons cause de sérieux dégâts sur les feuilles ; le traitement au DDT mouillable à 0,1 pour cent est efficace, et en l'absence de fruits l'arséniate de plomb au taux de 2 gm/litre est recommandé.

Comme *culture industrielle* nous avons le tabac. En cette saison la chenille qui cause le plus d'ennuis est une noctuelle qui porte le nom d'*Heliothis armigera*. L'endrin en pulvérisation est très efficace comme moyen de lutte. Il faut surtout faire le dernier épandage entre 20 et 30 jours avant la cueillette des feuilles.

Les *cultures maraîchères* étant maintenant très abondantes, nous allons leur consacrer un peu plus de temps. Ici, malheureusement, nous avons à signaler la présence d'une nouvelle peste à l'Ile Maurice sur le chou de chine et d'autres crucifères. Il s'agit d'une punaise phytophage que les entomologistes connaissent sous le nom de *Bagrada hilaris*. L'insecte est noir avec des taches jaune orangé. La femelle mesure 7 millimètres par 4 et le mâle 4 millimètres par 3. Le corps est subovale et la tête triangulaire. On le rencontre dans la partie ouest de l'île, plus

particulièrement dans les régions d'Abercrombie et de Gros Cailloux. Une destruction presque complète est obtenue par des pulvérisations d'orthodibrom ou de phosdrin au taux d'un centimètre cube par litre. On peut encore traiter au malathion. L'orthodibrom est aussi efficace contre les chenilles des choux.

Les fortes attaques du puceron noir de l'artichaut provoquent un dépérissement des plants. Nous préconisons surtout l'emploi de pulvérisations sur le feuillage d'insecticides téléotoxiques comme le rogor, le dimecron, le murphotox ou le phosdrin.

Sur les *petits pois* les dégâts des thrips sont facilement enrayés par des épandages d'orthodibrom ou de basudin ou encore de lebaycid.

En hiver, le pourcentage de fruits véreux de cucurbitacées est bien faible ; le développement des mouches des fruits étant contrarié par les basses températures et par le vent Toutefois, en cas d'attaque se servir du lebaycid à 0,1% ou du dipterex.

Les spécialités réservées au traitement de la pomme de terre sont légion. A Maurice, en cas d'attaque des feuilles par les charançons et les araignées rouges se servir d'un traitement mixte de DDT mouillable et de métasystox.

Contre la mineuse du haricot ou *Agromyza* l'enrobage des semences avec l'aldrin ou le dieldrin constitue le traitement préventif le plus facile à appliquer. On peut aussi employer l'aldrin à la dose de 1 c.c./ litre en pulvérisation dès la sortie des feuilles. Opérer en principe trois traitements.

Les *cultures florales* et *ornementales* qu'il faut traiter sont surtout les rosiers. On y rencontre un peu partout le *Macrosiphum rosae*, puceron de coloration verte ou brun pâle en colonies denses sur les jeunes parties des plants. La cochenille rouge est aussi très répandue à Maurice. Elle occasionne des dégâts graves dans les roseraies. Nous demandons à ceux qui ont constaté la présence de cette cochenille dans leur parterre de s'adresser au laboratoire d'entomologie pour les traitements nécessaires.

Un usage bien établi veut que les animaux appartenant au groupe des nématodes et des acariens soient étudiés en entomologie agricole, en même temps que les insectes. Nous ne pouvons donc nous empêcher de parler d'un dépérissement des gerberas et des chrysanthèmes. Les nématodes foliaires sont généralement cause de ce dépérissement. Il convient de répandre du chlortion en pulvérisation sur le feuillage comme traitement.

Ici également, nous voudrions parler des dommages causés par les myriapodes ou millepattes sur les racines d'*Anthurium*. Un poudrage au dieldrin à 2% est recommandé .....le DDT peut être également employé.

Nous ne pouvons passer sous silence la fourmi rouge ou *Solenopsis*

*geminata* qui cause des dégâts soit directement dans les pépinières, soit dans les plates bandes en transportant des pucerons et des cochenilles sur les jeunes plantes. Les exudations émises par ces derniers insectes sont la cause du noircissement des feuilles de beaucoup de plantes, appelé fumagine; cette coloration noire est due à plusieurs champignons qui s'y développent. On peut facilement protéger les pépinières contre les fourmis rouges en les entourant de dieldrin en poudre, ou en se servant de solutions d'aldrin ou d'heptachlor.

Il est indispensable pour l'agriculteur s'il veut lutter avec succès contre les ennemis des cultures qu'il sache utiliser les appareils d'épandage. En culture maraîchère et fruitière, pour la protection des plantes nous connaissons 3 procédés différents : la pulvérisation, l'atomisation et la nébulisation. Le procédé d'atomisation est celui que nous recommandons aux cultivateurs mauriciens ; autrement dit, nous préconisons l'emploi de pulvérisateurs à faible consommation d'eau, c.à.d. les atomiseurs portatifs genre Solo, Hurricane, Fontan, Blastador et Holder à moteur.

Les avantages du procédé de l'atomisation comparativement à la pulvérisation sont les suivants :

(1) Economie d'eau de 60 à 80% environ,

(2) Répartition régulière très fine du produit actif,

(3) Economie de temps de travail,

(4) Economie de produit actif de 10-20% car il n'y a pas de pertes dues au ruissellement.

Dans l'atomisation la buse ne doit pas être trop approchée du feuillage afin que le jet d'insecticide soit large et dense.

Pour bien traiter les plants le tuyau d'atomisation doit être continuellement déplacé de bas en haut. Se servir d'un récipient pour préparer le mélange et effectuer le brassage du liquide en se servant du tube de pulvérisation. Enfin, pour un meilleur rendement de travail nous recommandons de faire deux opérateurs se relayer tant pour le traitement que pour refaire le plein.

Pour terminer cet entretien un peu austère, ce dont je m'excuse, je dirai un mot simplement sur les adjuvants. Ce sont des substances qui renforcent l'action des pesticides. Sous ce nom on entend les mouillants, les adhésifs, les dispersants et les émulsifiants. Ces substances assurent de façon parfaite la répartition et l'adhérence des produits sur les plantes et les insectes réfractaires au mouillage. Nous nommerons ici des substances comme le teepol ou le triton ou l'adhésol qui permettent une pulvérisation plus économique en réduisant le gaspillage par ruissellement.

# GRADES, DEFINITIONS AND FEEDING VALUES OF BLACKSTRAP MOLASSES

By

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Our experience with blackstrap molasses has been quite extensive and diversified, as well as unique, for the reasons that: (1) We are the largest producer of blackstrap molasses in the Continental United States; (2) We are one of the few, if not the only large producer of blackstrap, distributing our entire production direct to the consuming trade as an identified product: (3) We are one of the largest, if not the largest consumer of blackstrap molasses for the direct feeding of livestock; and (4) We maintain a staff of outstanding sugar technicians in both our research department and the factory control laboratory, dedicated to the improvement in the processing and quality of sugar and sugar by-products.

### What is blackstrap molasses ?

The most correct definition of blackstrap molasses is found in the Cane Sugar Handbook — Spencer-Meade, 8th Edition — which is the most authoritative and the most widely used handbook by the sugar industry. « Blackstrap molasses is the by-product ,or end product of either raw sugar manufacture or refining. It is the heavy, viscous liquid separated from the final low-grade massecuite from which no further sugar can be crystallized by the usual methods. » We also quote from the same handbook on the subject of typical analysis. « The density of blackstrap as purged from the centrifugal ranges from 85 to 92° Brix, containing total solids by drying 77 to 84 percent approximately 45° to 47° Baume). The sucrose varies between 25 and 40 percent, and the reducing sugars from 30 to 12 percent, with total sugars about 50 percent as a rule. »

### What is cane feeding molasses ?

Disregarding the recently proposed and tentative definitions of cane feeding molasses, which are controversial and considered impractical by the majority of the cane molasses producers and distributors in this country, the definition of cane feeding molasses, recognized by the Association of American Feed Control Officials over the long period of years, was as follows: « A by-product of the manufacture of cane sugar from cane and shall contain 48% or more total sugars, expressed as invert sugar. Its solution in an equal weight of water shall test not less than

*Reproduced from *Sugar Journal* September 1959.

39.75° Brix. » In reality, cane feeding molasses as just defined, is the end-product resulting from the addition of water to blackstrap molasses and the manipulation and adjustment to a Brix of 79.5° at 20°C. Such manipulation and adjustment has been, and is still necessary, for the reason that many consumers are not properly equipped to receive and handle blackstrap molasses as it comes from the centrifugals of the sugar factories, due to its heavier density and viscous nature.

Here again, we have the distinction of having been the first large molasses producer, or distributor, of cane molasses to promote the use of mill-run blackstrap molasses, for the simple reasons that (a) it is more nutritious, (b) it requires the handling of less bulk with corresponding savings in transportation cost, (c) it has a lower moisture content, thereby permitting the use of more molasses in mixed feed, with less risk of heating. During recent years, by far the greater percentage of our production has been sold in this heavy concentrated form, with a guaranteed minimum Brix of 85°.

**What is high-test molasses ?**

High-test molasses, sometimes referred to as invert molasses or invert syrup, is a product obtained by concentrating clarified cane juice to a density of about 85° Brix and inverting with either acid or by the enzyme invertase, and it normally cantains between 70% and 80% total sugars. Again we quote from Cane Sugar Handbook — Spencer-Meade, 8th Edition — on the subject of invert molasses, or high-test molasses. « Strictly speaking, the product is an inverted syrup and not a molasses as the concentrated cane juice from the evaporators is the basis of the product. The milling, clarification, evaporation are the same as for sugar manufacture except that a minimum of lime is used in some cases none at all) to give a syrup (meladura) of about 6.0.6.3 pH. The inversion is effected in either of two ways, by acid or by in ertase (yeast), the latter method now being the more general. Inversion by sulfuric acid is carried out at a temperature of 195°-200° F., the sulfuric acid being in the proportion of 1-2½ gal. per 100 gal. of syrup. Heating is continued until a rapid analysis shows a polarization from 0° to 10°, after which milk of lime is added until a pH of 6.0 is obtained. It is then evaporated to about 85° Brix, the result being a deep red, viscous molasses containing about 78 percent total sugars of which about two-thirds is invert sugar and one-third sucrose. »

By far the greater volume of the supply of high-test molasses is consumed by the distilling, fermentation or chemical trade. In addition, at times, some of the high-test molasses is used in a blend with cane feeding molasses, blackstrap molasses or distillers solubles.

**Other types of industrial molasses**

In addition to the above described types of cane molasses, the over all industrial molasses supply also consists of beet molasses, a by-product

of beet sugar ; citrus molasses, a by-product of the citrus industry, and hydrol, a by-product of the corn industry. In addition, beet molasses, citrus molasses and hydrol are, at times, blended with one or more of the cane molasses described above. In the recent past, we have also heard of the blending of distillers solubles, with one or more of the three types of cane molasses which we have described.

**Recommended molasses definitions for regulatory control**

We have long advocated that each of the six Industrial Molasses, Blackstrap Molasses ; Cane Feeding Molasses, High-Test Molasses ; Beet Molasses; Citrus Molasses and Hydrol be accurately defined in brief but concise language and that minimum Brix form the basis for control for each, and further, that anyone engaged in the blending of any two or more of these six types of industrial molasses described, or distiller solubles, be required to register and describe the blend accurately and designate the percentage of each type of molasses or distiller solubles in the mixtures.

Each of these definitions and regulations should be adopted with the objective that it Pill not discriminate against the production from any source, so long as the production comes from standard, approved methods of processing generally practiced by the respective industry. We are of the very definite opinion that it is unwise to attempt to set up grades within any of the six specific types of industrial molasses discussed herein above.

We also feel that it is unwise and impractical to use moisture as a means of control. Correct moisture determination of blackstrap molasses is not as simple as is the case with other feedstuffs. According to our sugar technicians, syrups, massecuites and molasses must be dried on pumice or quartz sand for accuracy in moisture determination. Following is an outline of the procedures they use for determination of moisture in blackstrap molasses : " Prepare pure quartz sand between 40 and 60 mesh by digesting with HCl, washing free of acid, drying and igniting. Place 25-30 grams prepared sand and a short stirring rod in an aluminium moisture dish with cover. Dry thoroughly in 110° C oven, cool in dessicator, and weigh immediately. Add about 1-1.3 grams of molasses sample, cover and weigh accurately. Now add a small quantity of water from a wash bottle to moisten the sand and sample so that the sample may be mixed intimately with the sand, using the small stirring rod. Dry in vacuo (not over 50 mmHg) at 70° C for about 18 hours, or to constant weight. Cool and weigh immediately. Report loss in weight as moisture. "

It is reasonable to understand that while the problem of getting an accurate moisture determination for blackstrap molasses is well known to the trained sugar chemists that such may not be the case with regard to the average chemist engaged in feed control work, and this could lead into release of false moisture determination by control officials, causing confusion, disagreement and damage to the supplier of the molasses. Like-

wise, the use of minimum moisture as a means of control is unnecessary, for the simple reason that the Brix determination would indicate whether or not either product has been diluted excessively. While there is not a fixed relation between Brix and moisture, nevertheless the difference is not of enormous or serious proportion.

The use of sugar as a means of control is also impractical for the following reasons : The qualitative composition of blackstrap molasses must in general, be the same as of cane juice from which the molasses is derived, and such composition is quite variable because of such factors as variety of sugar cane, climatic condition and soil conditions. Consequently, the total sugar content of blackstrap molasses from each producing area, or factory, is variable from day to day and from each batch produced. Besides, blackstrap molasses is of such nature that it stratifies in storage and the only way that a good representative sample can be collected for sugar determination, is by the use of a drip sample from a cargo, while it is being pumped, or transferred, from one vehicle to the other.

In the case of the distilling and fermentation industries, where sugar, and only sugar, is important to them, they generally buy high-test molasses strictly on the sugar content and the only sugar analysis that they will officially recognize is one made by a qualified analytical laboratory specializing in sugar analysis and from a representative drip sample, as just described.

While sugar is the most important nutrient in blackstrap molasses, it contains other constituents that are important from an over all feeding standpoint. The purpose of any regulatory control law or regulation is, naturally, for the protection of the consumer. Blackstrap molasses and cane feeding molasses can readily be adulterated by man and we recognize the need for the protection of the consumer against unethical adulteration or blending. Establishment of minimum sugar content as a control, is not necessary for such purpose, for the simple reason that there is no known method where man can economically extract any degree of sugar from blackstrap molasses or cane feeding molasses.

The foregoing reasons are why we have been advocating that Brix, and only Brix, is a practical means of control for blackstrap molasses and cane feeding molasses. Furthermore, with the inexpensive investment for a Brix hydrometer, and the use of a scale, anyone can be taught to make a relatively accurate Brix determination. Therefore, Brix is a practical means whereby a customer can quickly verify whether he received what he bargained for or was a victim of unethical dilution.

### Other measures for consumers protection

Being in the dual roll of producer-distributor, selling an identified product of our own production, we naturally have had a great incentive in taking every measure possible to protect the consumers. As example, in

the case of each and every tankcar shipment, we require that a representative sample of the cargo be collected and delivered to our laboratory for an actual Brix determination and, in no event, do we permit a car to leave our yard if such Brix determination fails to be within a tolerance of two-tenths of one percent (0.2%) of the Brix desired by the customer. We follow this up by mailing a card to the customer, giving him the car number, the date of shipment and the exact Brix, as determined from the representative sample.

In the case of tanktruck deliveries, handled by common carriers, we attach seals to all tank outlets and list the number of these seals on a copy of the delivery ticket, which accompanies the shipment so that, upon delivery, it is possible for the customer to ascertain that the cargo was not tampered with while in transit.

In all cases wherein we market a blend or mixture of blackstrap molasses and other ingredients, we register the mixture, correctly described, with guaranteed analysis, with the Department of Agriculture of the state or states in which such mixtures are marketed.

**Feeding value of blackstrap molasses**

The over-emphasis on sugar content, and the use of guaranteed minimum content of sugar in definitions of blackstrap molasses, has undoubtedly led to a very erroneous impression that sugar, and only sugar, is of nutritive importance in blackstrap molasses. In other words, the false impression has been created that blackstrap is important as a feed ingredient only because of its carbohydrate value from its sugar content and its resultant value as an appetizer, or as an inhibitor of dustiness in mixed feed or its binding quality for pelleting of feeds.

In our extensive experiments in the feeding of blackstrap molasses in a mixed feed and, as a direct feed to livestock, we are very definitely of the opinion that the carbohydrates in the form of organic non-sugars, the content of minerals and minor elements essential to animal health and growth, and the content of vitamins also play an important role in the overall nutritive value of blackstrap molasses. Furthermore, the protein content is very definitely a nutritive factor.

Moreover, two different lots of molasses from different producing areas, with identical content of total sugars, could well be significantly different in feeding or nutritive value, depending largely on two things. *First,* whether or not the massecuite in the processing operation, or the blackstrap, subsequent to the processing, was subjected to excessive and prolonged heating, or whether or not the molasses entered storage at temperature in excess of 100°. The food value of the molasses constitutents and particularly, the stability of sugar, is adversely affected under conditions of abnormal overheating. Cases have been reported where, as a result of extremely excessive and prolonged overheating, large tanks of molasses have undergone such marked decomposition, that the contents

have changed to a dark, porous mass, resembling carbonized sugar. *Second*, the contents and feeding value of organic non-sugars varies from different producing areas.

With few exceptions, the content of total sugars in our production of blackstrap molasses would range between 48 % and 54 % , and the average reported T.D.N. is 60.4% . Any animal nutritionist would agree to the fact that a unit of Total Digestible Protein is more valuable or would cost more on the market than a unit of sugar. All of this supports the contentions that we have been making, that the sugar content is not the only source of nutritive value in blackstrap molasses.

It is natural that we, being in the position of producer-distributor, user, have a special interest and a great incentive in taking every precaution against damage from excessive and prolonged heating. Our factory personnel is always on the alert to see that the massecuite is not subjected to temperatures above established levels considered to be safe and, likewise, they also see to it that the molasses is not subjected to overheating subsequent to production, and that it enters storage at a safe level of temperature. All this is done for the purpose of protecting against unnecessary damage to the nutritive constituents of blackstrap molasses.

**Feeding practices**

Approximately sixteen years ago, we adopted the practice of feeding blackstrap molasses to cattle as a supplement to pasture. The adoption of this practice followed several years of large-scale experiments with the feeding of molasses in various mixtures of high-roughage feed, as well as a supplement to pasture. Under this practice the cattle have access to unlimited quantities of blackstrap molasses, free-choice, fed in unsheltered troughs, which are strategically located in the pastures.

In these very early experiments, we have found that the concentrated form of blackstrap as produced, was, of course, more nutritious. Besides, it required the handling of less bulk and it could be fed in unsheltered troughs with very little loss or damage when exposed to the elements. Having a density of 85° Brix or better, water from rainfall remains at the top and is readily consumed by the stock, without having caused appreciable co-mingling or damage to the molasses.

Another important discovery was that, while cattle may consume as much as 8 to 10 pounds of the more fluid grade of cane feeding molasses, they will self-restrict themselves to a more reasonable daily intake of approximately 4 or 5 pounds per day, when fed the more concentrated form of blackstrap molasses, under average pasture conditions.

About ten years ago, we became very alarmed over the very apparent mineral deficiency symptoms in our cattle. We discovered the futility of expecting all of the cattle to eat a sufficiency of salt-mineral mixture, containing the minerals known to be deficient in this area, and made accessible in self-feeding boxes, due to the natural unpalatable nature of such mixture. This caused us to initiate experiments of fortifying our

molasses with the essential minerals known to be deficient in the grasses in South and Central Florida. We consulted the nutrition department of the University of Florida. The credit is due them for advising us of the specific minerals and amounts we should add to our own production of molasses, so that, we could reasonably assume that cattle, on average pasture conditions, would be getting their minimum daily requirements of all the minerals known to be essential and deficient in the area, when consuming approximately 4 or 5 pounds of this blackstrap molasses-mineral mixture per head, per animal-day.

Immediately following this, we also initiated experiments in the fortification of molasses with urea and low-level phenothiazine. The addition of urea, was, of course, to be used only at certain times of the year when our pasture grasses were at a very low level of protein. The addition of low level phenothiazine was with the outlook of supplying approximately 1¼ to 2 grams per animal-day as an aid to control of internal parasites.

The addition of urea proved to be simple and was promptly put into practice, but such was not the case, with regard to phenothiazine. After several years of research work, with the cooperation of E. I. DuPont de Nemours, we finally became successful in not only stabilizing phenothiazine in our concentrated form of blackstrap molasses but, the personnel of our research department developed an improved and accurate method of analysis, which was subsequently approved by the DuPont Company and published in the March, 1956, issue of THE SUGAR JOURNAL.

Incidentally, with the use of old bathtubs, split steel drums and other miscellaneous type of inexpensive troughs, and two, four-wheel drive Jeeps, each with a mounted tank of approximately 600 gallon capacity, two men keep upward of 12,000 heads of cattle supplied with blackstrap molasses on Sugarland Ranch. Therefore, when considering the relatively low cost of blackstrap molasses, the benefits derived, and the efficiency with which it can be fed to cattle as a supplement to pasture, it makes the practice most attractive.

The benefits we derived from feeding such a fortified blackstrap molasses, on a free-choice basis to cattle, are manyfold. We mention a few, as examples : (1) We have practically eliminated the symptoms of mineral deficiencies and resultant loss of productivity ; (2) The combination of drenching our cattle with a therapeutic dose of phenothiazine in the spring and in the fall, and the continuous use of low-level phenot iazine, cause our cattle to be relatively free of heavy worm infestation ; (3) Our young cattle put on more weight and grow better and develop into larger animals at maturity ; (4) Our-breeding cows are in better flesh and have a better health appearance and consequently, are in better position to conceive and possess better mothering ability ; and (5) We have experienced tremendous increase in percentage of calf crop and, as a result of the improved mothering ability, the calves are stronger at birth and weigh more and grade higher at weaning time.

**Recommendations**

In view of our many years of extensive and diversified experience in the threefold role of producer-distributor-user, we should like to summarize some of our conclusions and recommendations.

1. We recommend that correct and concise definitions be adopted by the Association of American Feed Control Officials for each of the six grades of Industrial Molasses : Blackstrap Molasses ; Cane Foeding Molasses ; High-Test Molasses ; Beet Molasses ; Citrus Molasses and Hydrol.

2. There should be only three basic grades of cane molasses : blackstrap molasses, cane feeding molasses and high-test molasses, and our recommendation of a brief and concise definition for each of these three grades, is as follows :

« *Blackstrap Molasses* is the by-product of either raw sugar manufacture or refining. It is the heavy, viscous liquid separated from final low-grade massecuite from which no further sugar can be crystallized by the usual methods. Its solution in an equal weight of water shall test not less than 42.5° Brix. »

« *Cane Feeding Molasses* is blackstrap molasses to which there has been added fresh water for the purpose of manipulation and adjustment to a Brix of less than 85°. Its solution in an equal weight of water shall test not less than 39.75° Brix. »

*High-Test Molasses or Invert Syrup* in the product obtained by concentrating clarified cane juice to a density of approximately 85° Brix and inverting either with acid or by the enzyme invertase. Its solution in an equal weight of water shall test not less than 40.0° Brix. »

3. Regulations should be adopted and enforced requiring that each blend or mixture of any one or more of the above recommended grades of cane molasses, or distillers solubles, or other substitutes, be correctly described as such, when in the act of advertising, selling and invoicing of same, in addition to being required to conform to a guaranteed minimum Brix.

4. That any official releases by the U. S. Department of Agriculture, on the subject of feeding value of blackstrap molasses, stress the fact that sugar is not the one and only nutritive constituent and that the proper appraisal of its food value should take into consideration the Total Digestible Nutrients (T.D.N.). Other incidental, but nonetheless important items of consideration, in evaluating molasses as a feedstuff are : Its palatability and resultant appetizing effect its value as an inhibitor of dustiness in feed ; its value as a binder in pelleting feed ; and its unique value as a suitable vehicle for the incorporation of drugs, essential minerals, urea, etc , when used as a direct feed for livestock.

In conclusion we should like to call attention to the fact that, with the exception of a few short periods of abnormal peak prices, blackstrap has been most reasonably priced, when considering its full feeding value, in relation to other feedstuffs.

# REVUE DES PUBLICATIONS TECHNIQUES

ANONYME (1960) — **Rapport Annuel 1959 de l'Institut Français de Recherches Fruitières Outremer — Bananes.** *Fruits*, **16**, 6, 187-188.

*Variétés* — Sept variétés ont été étudiées en Guinée Les variétés les plus hautes sont les plus sensibles aux chutes (Gros Michel — Lacatan — Manéah). Le bananier nain a fait ses preuves et présente un réel intérêt. Au Congo et au Cameroun est étudié le remplacement du gros Michel trop susceptible à la maladie de Panama. La variété Poyo est à l'essai.

*Densités et dispositifs de plantation* — 2,000 à 2,850 pieds/ha (800 pieds/arpent semble être l'espacement donnant les meilleurs résultats pour la variété Gros Michel — Au congo en culture sèche on ne peut obtenir des régimes exportables si le nombre de 835 pieds/ha (335 pieds/arpent) de la même variété est dépassé.

*Matériel végétal* — On obtient de meilleurs rendements et une production plus précoce en plantant des souches avec rhizome alternant et un rejet bien developpé. La conservation d'une portion de l'ancien stipe (1,80m à 2m) a aussi une bonne influence sur la précocité.

*Déchaussement* — Le déchaussement, cause principale des chutes lors des tornades, pourrait possiblement être atténué en pratiquant une plantation plus profonde (60 cm) des souches et en rebouchant partiellement les trous au cours du premier cycle et entièrement au cours du second.

*Oeilletonnage* — L'œilletonnage chimique au 2,4-D donne des résultats positifs et est entré dans la pratique courante des Antilles. Sur Poyo, l'oeilletonnage total jusqu'à 5, 7, 9 & 11 mois après la plantation augmente le rendement et le poids moyen au premier cycle.

*Désherbage* — Aux Antilles on obtient de bons résultats avec des atomisations de diuron et de PCP dans l'huile. Au Cameroun les traitements au 2,4-D et au 2,4,5-T contre la ramie ne sont pas rentables et restent sans effet contre le *Pennisetum purpureum* et le *Cyperus*.

*Fumure* — La tendance générale des résultats permet de recommander le fractionnement des épandages d'engrais solubles. En Côte d'Ivoire, la dose la plus rentable de fumure minérale sur bananier nain serait 1 kg par pied et par an d'un engrais complet 5-12-24.

Les formules de base destinées à améliorer les rendements étant maintenant établies sur toutes les stations, il semble que la recherche doive s'orienter sur des formules de fumure spécia es en vue d'améliorer la qualité du fruit en agissant sur la longueur du cycle de végétation, la qualité étant meilleure quand le cycle est plus long.

*Défense des cultures* — Contre le Cercospora l'emploi des fongi-

cides huileux est efficace. Contre la maladie de Panama la culture de la variété Poyo résistante à cette maladie est à l'étude au Cameroun où elle est appelée à remplacer la variété Gros Michel jusqu'ici cultivée. Contre le charançon du bananier, diverses doses et modes d'emploi d'insecticides sont encore à l'étude.

Contre les nématodes préférence est donnée au Némagon sur le Dibrométhane et le D.D. en raison de sa plus grande efficacité et de son absence de phytotoxicité. La dose de 40 l/ha de Némagon émulsion à la plantation donne les meilleurs résultats pour la production du 1er cycle. Les études se portent actuellement sur le fractionnement des applications et de la dose la plus efficace au départ. Au Cameroun le Gros Michel est peu sensible aux nématodes, mais son remplacement par la variété Poyo pourrait poser des problèmes. Contre les chenilles, les traitements au dieldrin donnent d'excellents résultats. C'est en Guinée que leurs dégâts sont les plus importants. On a pu aussi observer des parasites naturels.

*Physiologie* — Trois essais destinés à mettre en évidence les principales lois de la nutrition minérale du bananier nain en relation avec sa croissance sont en cours ; leur but est de permettre une interprétation plus rigoureuse du diagnostic foliaire de cette plante en toute circonstance. Des cultures sur solutions nutritives dont on fait varier les teneurs en azote et en potasse permettront de déterminer l'effet de ces éléments sur le goût et la qualité du fruit. En plantation, l'application du diagnostic foliaire a permis de résoudre un certain nombre de problèmes.

BUTTERWORTH, M.H. (1961) — **Studies on Pongola grass at I.C.T.A. Trinidad — II The digestibility of Pongola grass at various stages of growth.** (Digestibilité de l'herbe Pongola à différents stades de croissance). *Tropical Agriculture* 2 : 109-113.

L'auteur a entrepris une étude sur la composition chimique et la digestibilité des matières protéiques de l'herbe Pongola à différents stades de croissance sur six moutons de la race « Black-Head Persian ».

Voici un tableau des résultats de cette étude portant particulièrement sur la teneur et la digestibilité des matières protéiques —

| Age de la pâture ... ... | 10 jours | 15 jours | 21 jours | 42 jours |
|---|---|---|---|---|
| Matières protéiques % mat. sèches ... | 14.9 | 13.8 | 9.2 | 4.8 |
| Cœfficient de digestibilité... ... | 71.5 | 65.6 | 57.6 | 18.8 |

Si l'on considère que la teneur des pâtures en protéines doit être de 8 à 12 pour cent de matières sèches pour satisfaire aux besoins nutritifs normaux du bétail, on constatera que l'herbe Pongola possède cette qualité à un taux relativement élevé ; mais par contre il perd rapidement de sa teneur en matières protéiques dont la disgestibilité s'atténue tout aussi rapidement. En conclusion l'auteur souligne l'importance des pâturages pratiquées à l'époque où l'herbe est la plus riche en matières protéiques à défaut de quoi sa grande valeur alimentaire en sera considérablement réduite.

JACK, R. C. M. (1961) — **Nutrient imbalance in sugarcane as revealed by foliar analysis**. (Déséquilibre nutritif chez la canne à sucre révélé par l'analyse foliaire). *Tropical Agriculture*, 3 : 231-33.

Étude entreprise dans le but de déterminer la cause encore inconnue d'une brûlure des feuilles de la canne à sucre observée aux mois d'août et septembre 1959 dans la région sud de Trinidad. Dans cette région la pratique courante était d'employer presque exclusivement le sulfate d'ammoniaque comme engrais, les terres de la région d'après les analyses du sol étant suffisamment pourvues en potasse.

Des prélèvements de la 3ème feuille sur des plantations en repousses âgées de 4 mois montrant des symptômes de brûlures furent faits, ainsi que sur des plantations de même catégorie, mais indemnes de brûlures, pour servir de témoin.

Voici les résultats obtenus :

| | N | P | K | Ca | Mg % matières sèches |
|---|---|---|---|---|---|
| Cannes montrant les symptômes | 2,1 | 0,23 | 0,88 | 0,30 | 0,22 |
| Cannes indemnes | 1,95 | 0,24 | 1,22 | 0,23 | 0,13 |

Selon les données déjà établies une teneur de plus de 1,83 en azote est excessive ;

une teneur de 0,23 — 0,24 en phosphore est normale ;

une teneur au-dessous de 100 en potasse est déficiente ;

une teneur basse en potasse est associée à une augmentation de celle de la magnésie.

Il ressort donc que les symptômes de brûlures observés sur les cannes de cette région de Trinidad étaient dûs à une déficience en potasse accentuée par une teneur excédentaire en azote. La pratique se reposant sur les analyses de sols qui avaient jusqu'ici indiqué que les sols sablonneux et les sols argileux avec une teneur potassique de 50 et 75 ppm respectivement ne nécessitaient pas de fumure potassique, doit certainement être revisée.

NIEKERK, G. P. Van (1961) — **Factors affecting the quality of eggs during marketing.** (Facteurs affectant la qualité des œufs offerts en vente).
*The Rhodesia Agricultural Journal*, 3 : 167.

L'œuf de poule contient de la protéine, des minéraux et des vitamines qui sont des matières essentielles dans l'alimentation humaine. Il est produit dans des conditions hygiéniques naturelles qui sont pourtant sou-

vent détériorées par la négligence ou l'insouciance de l'homme jusqu'au point où il devient impropre à la conservation.

Pour assurer la bonne conservation des œufs dès leur production et jusqu'à leur consommation, il faut leur apporter certains soins essentiels qui sont résumés ci-dessous.

Il faut procurer aux poules des nids propres et bien aérés. A la ponte les œufs sont humides et peuvent facilement se souiller. Les souillures entraînent souvent la contamination par des bactéries qui pénètrent à l'intérieur des œufs à travers les pores de la coquille et occasionnent leur détérioration rapide. La température naturelle de la poule est 106°F. (41°C,) et c'est pendant que les œufs sont encore chauds qu'ils sont le plus susceptibles à la contamination par les bactéries. Il est donc essentiel que les œufs se refroidissent le plus rapidement possible dans un milieu propre et bien ventilé.

A la collecte, les œufs doivent être placés dans une corbeille à claire-voie et examinés individuellement en vue de les rapproprier si nécessaire. Tous les œufs doivent être essuyés afin d'enlever les poussières et ceux qui auront été souillés doivent être nettoyés à l'aide d'une brosse ou d'un léger abrasif et ensuite essuyés avec un chiffon humecté d'un peu d'huile végétale légère. L'emploi de l'huile ne permet pas seulement de nettoyer les œufs, mais encore d'obturer les pores de la coquille et les rendre imperméables aux bactéries. L'emploi de l'eau pour le nettoyage des œufs n'est pas recommandé. Aussitôt après nettoyage les œufs doivent être placés par douzaines dans des boîtes en carton spécialement fabriquées à cet effet et seront ensuite expediés sur le marché.

L'entreposage des œufs doit se faire à une température au-dessous de 60°F (15,5°C) et à une humidité relative d'environ 80 p.c. La conservation des œufs à des températures au-dessus de 60°F et à une humidité relative plus basse provoque une détérioration rapide et favorise le développement embryonnaire. Les œufs doivent toujours être emmagasinés ou exposés séparément des autres denrées alimentaires telles que poissons, légumes, fruits, fromages et viandes.

La distribution des œufs de la ferme aux consommateurs doit se faire le plus rapidement possible en suivant les recommandations rapportées plus haut et au cours d'une période n'excédant pas 4 jours si possible.

SKINNER, J. C. (1961) — **Sugar cane selection experiments 2. Competition between varieties**. *Bur. Sug. Exp. Stas. Qd. Tech. Comm.*, No. 1.

This paper discusses the influence which competition between varieties has on the efficiency of a breeding programme with sugar cane. From the results of a detailed series of experiments in Queensland, the author shows by statistical methods that competition between different

varieties is most extreme when varieties are grown side by side in very small plots. In the early stages of selection the choice must be made between the testing of many varieties using a smaller plot size or the more accurate comparison of fewer varieties. The effects of competition can be detected even in three-row plots of 0.01 acre although as plot size is increased, competition is diminished accordingly. Thus the way to decrease competitional effect in a variety trial is different to that generally adopted to increase the accuracy of a trial, namely to increase the number of replications.

Competition between one variety and another was found to influence weight of cane. Sugar contents were little affected. Weights were mainly changed by alterations in the number of cane per unit distance and this could be due to competition for light by adjacent stalks or else be caused by root competition.

**Rep. B. W. I. Sug. Cane Breed. Sta. 1959 — 60.**

In a section of this report, an experiment is described testing the merits of bunch planting as a method of selecting newly produced cane seedlings. « Synthetic » bunches were prepared by potting up single-eyed cuttings of commercial varieties which were known to possess differences in early growth rate. Eventual selections from these bunches led to the conclusion that known commercial varieties could be discarded if they had been « bunched » with another variety with a faster early growth. In consequence of this and other experiments bunch-planting of seedlings is not now much favoured in Barbados.

The mistake which is perhaps made in the above comparisons is to forget that 90% of the seedlings produced by most sugar cane crosses are of very poor vigour and no worth If in bunch planting, the remaining 10% compete favourably with the poor seedlings, the technique is of value. There is always the probability that two potentially good varieties will occur in the same bunch and one will be eliminated, but the risk of this happening is slight and no greater than any other risk encountered in selection.

BOYES P. N. (1960) — **Starch in the manufacture of raw sugar**. *Proc. S. Afr. Tech Ass.* **34:** 91-93.

The work done up to now on starch has shown the importance of this substance in cane sugar manufacture. From the results of analyses of cane juices it has been found that the starch content of cane is dependent upon both the variety of the cane and the type of soil upon which it is grown. Analyses carried out on the juice extracted from various units of a mill have shown that the crusher and 1st mill extract about 70% of the total starch extracted, the 1st mill extraction of starch being higher than that of the crusher.

In an attempt to find a practical method of starch removal from juice an investigation was carried out in three factories crushing similar canes in the same area. The starch content of their mixed juice was similar, but the starch content of their raw sugar differed widely. Analyses of starch samples taken from their juice streams showed that the elimination of starch was taking place through enzyme action namely in the primary juice tanks. For starch elimination to take place the raw juice had to be heated to 70-80°C, but not more than 80°C, and allowed to remain for 7-20 minutes. Juice at 5.2 pH when heated to 70°C for 10 minutes lost 3 per cent sucrose ; this sucrose loss could be lessened by liming to 7.6 pH, but then no starch removal occurred. By adding Oliver filtrate until the pH was 5.8 — 6.0 the sucrose loss could be reduced to 17 per cent for 15 minutes at 70°C, starch removal of 50-60 per cent being then obtained. The process finally adopted was to mix Oliver filtrate with raw juice up to a pH of 5.8-6.0, heat to 70-80°C and allow to settle for 8-12 minutes in the tanks before adding the primary lime. In connection with sucrose losses thus occurring during starch removal, the author observes that it would be interesting to find out to what extent this is compensated by an increased boiling-house efficiency resulting from starch removal.

TZU-SIN, CHIN & TON-YUAN, LIN. (1960) — **The removal of starch from cane juice by enzymatic process.** (A study of Nicholson and Hornsley's process). *Taiwan Sug.* **7** (9) : 21-24.

Although the cause of high resistance to flow during raw sugar refining is not very clear, starch is generally believed to be one of the most deleterious impurities associated with poor filterability. Many processes have been suggested for the removal of starch from sugar cane juice but almost all are uneconomical. However, the method employed by Nicholson and Horsley requires neither additional materials nor plant alteration. According to these authors starch can be removed from juice by heating the latter to 70°C and holding it at that temperature for a certain length of time.

This paper reports the application of the process to Taiwan juices. At the same time, the degree of inversion caused was determined and an assessment of the behaviour of treated juices towards subsequent defecation made.

Batches of mixed juice were heated to temperatures ranging from 70° C to 90° C for various intervals of time. Each batch consisted of four 100 ml samples immersed in a constant temperature water or oil bath. As soon as the desired temperature was attained, which usually took 6-7 minutes, one sample was removed, cooled under running water and 200 ml absolute alcohol added to inhibit enzymic activity. The other three samples were similarly treated after staying 15, 20 and 25 minutes respectively in the bath. The samples were kept in a refrigerator and subsequently analysed.

It was found that at 70°C little starch was removed, the optimum temperature for Taiwan juice being somewhere in the range 80°C-85°C. Comparison between factory-heated juices show that within the 80°-85°C range, the natural enzyme in factory mixed juice is still active but is destroyed at 105° C. Working at pH 5.5 - 6.0 is preferable. Inversion of sucrose was practically negligible Sedimentation rates of treated juice was slower than for untreated juice. This may be due to the loss of the polyelectrolyte effects of starch.

WINTERTON, V. S. (1960) — **Mixed juice screening at Doornkop.** *Proc. S. Afr. Sug. Tech. Ass.* **34**: 70-71.

At Doornkop mill, the mixed juiced is first screened by means of a cush-cush screen and then the fine bagasse is removed by means of a Hummer juice screen. This latter type of screen differs from the more usual types in that the vibration is confined to the screening surface only. This screening surface vibrates only at right angles to its surface. As a result of this, there is no tendency for the screen to act as a conveyor and it has to be placed at an angle of about 30° to the horizontal so that the discharge may be effected by gravity.

This design results in a much longer life of the screens and enables steam cleaning to be carried out much more effectively Moreover, the whole mechanism causing the vibration is totally enclosed, needs no lubrication and can be easily adjusted to suit various conditions. The inclined screen also causes a reduction in the effective diameter of the screening apertures and although the screening efficiency is better than ordinary screens, the capacity is much lower. The capacity can be improved by using 30 x 30 mesh screen with .0076" wire thickness instead of the 60 x 40 mesh woven screen with 0.009" wire thickness used originally. The use of a special feed box designed to spray the juice on the screen at right angles to its surface may also help in this connection, but care must be taken that the feeding capacity of the box is not too high for the capacity of the screen.

With the 30 x 30 mesh screen and a weir feeder the capacity of the screen was 2½ to 3 tons juice per sq. ft screen area per hour, the mixed juice going to the process then containing less than 100 p.p.m bagacillo. According to the author, the only disadvantage of the Hummer screen is the fact that it is somewhat noisy in operation.

RAMACHANDRAN, S. & RAJAGOPALAN, S. R. (1961) — **Chromium plating reduces scale adhesion.** *Sug Azucar*, **56** (8) : 31.

One of the surface properties of chromium is its non-wettability, especially if the surface is clean and bright. This property is made use of in many chemical industries where the material handled is prone to incrustations.

Tests were carried out to determine whether adhesion of scales as usually found in tubes of sugar evaporators also would be poorer or more easily removed on chromium plated surfaces. Brass and mild steel rods 36" x $\frac{1}{4}$" diam. with and without chromiun plate were kept in position by spot welding inside the calandria tubes of the 3rd and 4th effect of an evaporator set for nine days, after which the scales on the rods and calandria tubes were examined. It was found that the scales depositing in the calandria tubes and on the unplated rods would also deposit on the chromium plated rods. However, though the scales on the unplated rods could be removed only by hard scrubbing with a steel brush, it was interesting to observe that the same scales deposited on the chromium plated rods could be easily removed by applying a gentle pressure tangential to the surface or even by gentle tapping.

WEBRE, A. L. (1960) — **A new idea in the maintenance of vacuum in pans.** *Proc. Assoc Techn. Azucar P. R.* 7 pp.

When each pan in a factory is fitted with its own condenser, fluctuations of vacuum still occur whenever a pan is put into operation if there is only one vacuum pump for all the condensers. The use of a separate auxiliary pump to raise the vacuum in a pan before it is connected to the system helps, but in practice it is difficult to have the operators wait until the vacuum is sufficiently high to make the change over to the general system, and vacuum drops of the order of 2 to 3 inches may be thus caused.

A common mistake with central vacuum pumps is to have too large connections between the pump and each condenser for this results in the pan with the least vacuum getting the maximum removal of non-condensable gases whilst it is the reverse that should be the case. This can, however, be remedied by the use of a 2" by-pass round the vacuum valve of each condenser and working with the valve closed and the by-pass open.

All these troubles can be avoided by having independent vacuum pumps for each condenser, but owing to the high initial cost of the usual type of vacuum pump and to the expense involved in maintenance, this is not the generally acce ted practice. These disadvantages, however, need not apply to a hydraulic pump described by the author. Of quite simple design, the first unit of this type was built in a sugar mill workshop. These hydraulic pumps are efficient in operation and a whole series of them may be fed with water by means of a single centrifugal water pump. They have moreover no moving parts to get out of order, the gases being removed by means of jets of cold water. Unlike ordinary vacuum pumps they would not be in the least affected if a slug of water should come along, and the author sees no reason why their use should not become established in the sugar industry as a means of avoiding vacuum fluctuations in pans.

## SEPTEMBRE 1961

### A. Pluie (pouces) et différences de la normale

| Période | Ouest | Nord | Est | Sud | Centre |
|---|---|---|---|---|---|
| 1 — 5 | 0.11 | 1.00 | 0.53 | 0.68 | 0.96 |
| 6 — 10 | 0.13 | 0.41 | 0.55 | 1.17 | 0.21 |
| 11 — 15 | 0.00 | 0.01 | 0.05 | 0·05 | 0.07 |
| 1 — 15 | 0 24 (—0.08) | 1.42 (+0.58) | 1.13 (—0.84) | 1.90 (+0.07) | 1.24 (—0.55) |
| 16 — 20 | 0.00 | 0.17 | 0.07 | 0.11 | 0.12 |
| 21 — 25 | 0.07 | 0.42 | 0.53 | 0.69 | 1.35 |
| 26 — 30 | 0.08 | 0.29 | 0.46 | 0.41 | 0.57 |
| 16 — 30 | 0.15 (—0.17) | 0.88 (+0.08) | 1.06 (—0.58) | 1.21 (—0 35) | 2.04 (+0.52) |

### B. Température (°C)—Maximum, minimum et différences de la normale

| | | | | | |
|---|---|---|---|---|---|
| 1 — 15 | 27.5<br>17.2 | 25.3 (—1.2)<br>16.1 (+0.2) | 27.1<br>16.3 | 24.5 (—0.7)<br>16.7 (—0.7) | 22 2 (+0.7)<br>14.3 (—0.8) |
| 16 — 30 | 27.7<br>17.7 | 25.4 (—1.8)<br>17.1 (+0.8) | 27.6<br>17.1 | 24.9 (—0.8)<br>17.4 (—0.6) | 22.2 (—0.1)<br>15.6 (+0.1) |

### C. Vélocité (nœuds*). Moyenne quotidienne des vélocités horaires les plus élevées et maximum horaire

| | | | | | |
|---|---|---|---|---|---|
| 1 — 15 | 9 (17) | 9 (14) | 9 (13) | 12 (18) | 10 (14) |
| 16 — 30 | 12 (18) | 13 (17) | 11 (16) | 15 (23) | 12 (17) |

*Pour convertir en milles à l'heure multiplier par 1,151.

## STATISTIQUES DES CONDITIONS MÉTÉOROLOGIQUES

### Octobre 1961

**A. Pluie (pouces) et différences de la normale**

| Période | Ouest | Nord | Est | Sud | Centre |
|---|---|---|---|---|---|
| 1 — 5 | 0.07 | 0.40 | 0.08 | 0.17 | 0.22 |
| 6 — 10 | 0.04 | 0.87 | 1.00 | 1.27 | 1.06 |
| 11 — 15 | 0.87 | 0.20 | 0.48 | 0.16 | 0.54 |
| 1 — 15 | 0.98 (+0.44) | 1.47 (+0 59) | 1.56 (—0.04) | 1.60 (+0.14) | 1.82 (+0.37) |
| 16 — 20 | 0.42 | 0.27 | 0.60 | 0.75 | 0 74 |
| 21 — 25 | 0.29 | 0.00 | 0.15 | 0.05 | 0.05 |
| 26 — 31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 16 — 31 | 0.71 (—0.05) | 0.27 (—0.71) | 0.75 (—1.04) | 0.80 (—0.98) | 0.79 (—0.78) |

**B. Température (°C)—Maximum, minimum et différences de la normale**

| | | | | | |
|---|---|---|---|---|---|
| 1 — 15 | 28.3<br>18.1 | 26.8 (—1.2)<br>18.0 (+1.3) | 26.4<br>17.4 | 25.7 (—0.4)<br>18.6 (+0.2) | 23.2 (+0.2)<br>16.2 (+0.3) |
| 16 — 31 | 29.0<br>19.4 | 28.5 (—0.3)<br>18 5 (+1.2) | 25.4<br>18.1 | 26.6 (—0.2)<br>19.0 (+0.4) | 25 0 (+1.1)<br>17.3 (+0.8) |

**C. Vélocité (nœuds*). Moyenne quotidienne des vélocités horaires les plus élevées et maximum horaire**

| | | | | | |
|---|---|---|---|---|---|
| 1 — 15 | 9 (14) | 13 (19) | 10 (14) | 11 (20) | 11 (16) |
| 16 — 31 | 8 (13) | 13 (17) | 8 (10) | 15 (19) | 10 (15) |

*Pour convertir en milles à l'heure multplier par 1,151.

(A)

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(B)

(C)

(D)

(E)

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(B) *Below :* Removing Scale from Babcock & Wilcox Boilers in an Indian Refinery.

(C) *Below :* Cleaning the tubes of horizontal Juice Heating Plant in an Indian Sugar Factory.

(D) 'Skatoskalo' Electric, Petrol-Driven and Pneumatic Machines, rotary Scaling tools, wire brushes etc., are designed to do routine cleaning and descaling work quickly, positively and thoroughly.

(E) *Left :* Operating two machines simultaneously of the cleaning of an evaporator.

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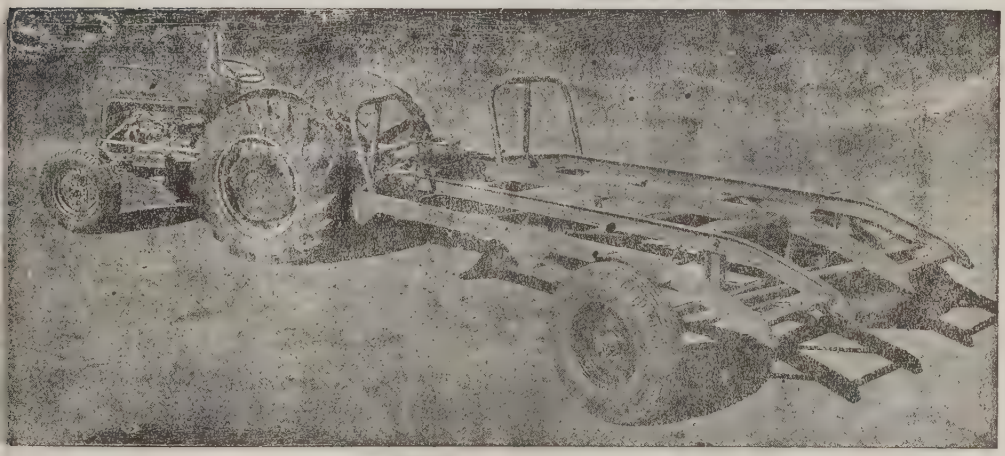

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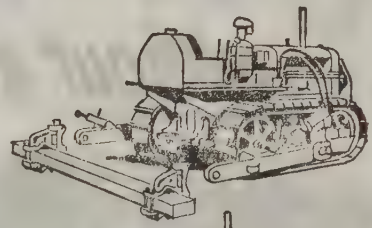

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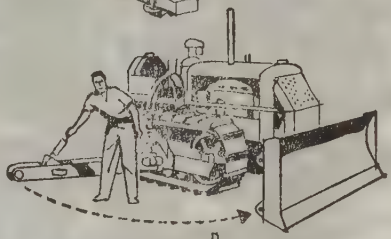

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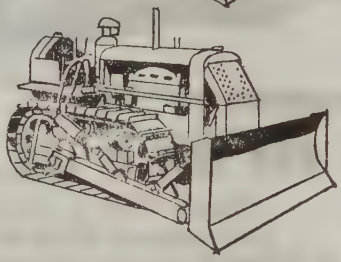

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**LA CULTURE DU THÉ EXIGE DES FERTILISANTS—**

## mais pour avoir plus de thé il faut plus de fertilisants

Réalisons-nous la richesse que la culture du thé enlève à la terre ? C'est vraiment renversant ! 1,000 kgs. de thé commercial par hectare enlève du sol 50 kgs. de nitrogène, 9 kgs. d'acide phosphorique et 25 kgs. de potasse. Ces engrais doivent toujours être remplacés. Avec un emploi adéquat de fertilisants des augmentations de 100% dans la production sont possibles. Sur une plantation de thé aux Indes des applications régulières — par arpent — de 80 lbs de nitrogène (sous forme de Nitro Sulphate d'Ammoniaque) 20 lbs d'acide phosphorique et 40 lbs de potasse, ont donné une production de 1,000 lbs de thé commercial de premier choix, en moyenne, à l'arpent. A Ceylan 283 millions de livres de thé furent récoltées en 1946 sur 553,000 arpents. En 1956, 376 millions de livres récoltées sur 570,000 arpents. Cette augmentation fut principalement obtenue par l'emploi intensif des fertilisants. Avec les fertilisants, le potentiel d'expansion qui reste, dans le domaine mondial des plantations de thé, peut devenir une réalité. Les capitaux investis dans l'achat des fertilisants rapportent gros très rapidement. Il a pu être constaté partout que pour chaque dollar dépensé en nitrogène a donné dans la même année quatre dollars ou plus.

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